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COMMERCIAL FISHERIES Review

DIV: OF FISHES

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Dr. Robert M. White, Acting Administrator

NATIONAL MARINE FISHERIES SERVICE
Philip M. Roedel, Director

COVER: Alaskan woman has elemental tie to other natives.
(S. Hadwen)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the National Marine Fisheries Service (formerly Bureau of Commercial Fisheries).

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

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Throughout this book, the initials NMFS stand for the NATIONAL MARINE FISHERIES SERVICE, part of NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), U.S. Department of Commerce.

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CONTENTS

	Page
UNITED STATES	
Events and Trends	1
ARTICLES	
In the Northeastern Gulf of Mexico ~~ Harvesting Coastal Pelagic Fishes With Artificial Light & Purse Seine, by Donald A. Wickham	30
Evidence indicates that ~~ A Premix of FPC & Wheat Flour Can Be Made & Transported, by Virginia D. Sidwell, Bruce R. Stillings, & George M. Knobl Jr.	39
INTERNATIONAL	42
Asia	47
Europe	52
Latin America	55
INDEX	56

A RARE MEETING OF 9 NOAA SHIPS AT PACIFIC MARINE CENTER, SEATTLE, WASH. Seven serve the National Ocean Survey; two, the National Marine Fisheries Service: Miller Freeman (1), George B. Kelez (2). (Photo: Larry Dion, Seattle Times)

U.S. & USSR HOLD SCIENTIFIC EXCHANGE ON NORTHEAST PACIFIC FISHERY PROBLEMS

U.S. and Soviet delegates met in Moscow, Dec. 3-9, 1970, to exchange data on the biology and status of Pacific hake and rockfish (including Pacific ocean perch). They sought to coordinate objectives and organize joint research on hake and rockfish in 1971. They discussed ways to improve the methods of estimating the abundance of Pacific hake and rockfish. They discussed, too, the effect of the Pacific hake fishery on other fish caught incidentally.

Pacific Hake

Both sides agreed that commercial-size stocks continue to decline due to gradual elimination of abundant 1960-61 year-classes and replacement by less-abundant 1962-65 year-classes.

Soviet data appear to indicate that 1966-67 year-classes are stronger than 1962-65 classes. The entry of 1966-67 classes into commercial fishery in 1971-72 will improve commercial hake stocks--compared with 1969.

U.S. age frequency data collected off Washington and Oregon do not corroborate Soviet view. However, both sides agreed that 1966-67 year-classes are not as abundant as 1960-61; that smaller 1962-65 year-class sizes resulted from natural causes, not from effects of commercial fishery.

Pacific Ocean Perch

Both sides agreed that stocks in Oregon-Vancouver Island area continue to need protection. Preliminary Soviet data from early 1970 hydroacoustic surveys indicate increase in 1970 standing stock off Washington-southern Vancouver Island. The figure is about 40,000 metric tons, compared with 33,000 tons in 1969. Also, concentrations of young fish suggest beginning of rehabilitation. The data, however, need to be refined. No improvement was seen in stock condition off Oregon.

Other Rockfish

Soviet hydroacoustic and trawl surveys in Jan.-March 1970 estimated standing stocks of all species off north California, Oregon, Washington, and southern Vancouver Island at about 350,000 metric tons. About 75% are distributed off Washington and southern Vancouver Isl.; 20% off Oregon; 5% off California.

'Sebastodes flavidus' accounts for 65%--half of this off Washington. This indicates no substantial change from 1969 assessment and species distribution. S. flavidus stocks also show no adverse effects from recent commercial fishing. Stocks of other rockfish species (S. proriger, S. diploproa, S. crameri) are considered by both sides to be at very low level and to require protective measures.

Shrimp

Both countries recommended joint investigations. These will include changes in condition of different populations under fishery pressure, seasonal migration, and distribution on Continental Shelf in Gulf of Alaska in 1971.

The Soviets will assign 'R/V Kril' in Jan.-Mar. 1971 on high seas from Sanak Island to North Portlock Bank. (Contiguous fishery zone will be included if U.S. permits.) The U.S. will assign 'R/V Oregon', Apr.-Sept., and 'R/V Resolution', Apr.-May, to operate off Kodiak Island. Scientists will be exchanged.

Joint Research

(a) Ichthyoplankton studies: Hake fecundity data will be collected by U.S. in main spawning area from Dec. 1970-Feb. 1971; then jointly by U.S. and Soviets in Dec. 1971-Feb. 1972. Data will be processed by the U.S.

(b) Hydroacoustic studies: The U.S. will determine statistical variance of hydroacoustic surveys. The Soviets will develop computer techniques for processing the data, and determine best times and areas to survey feeding hake and rockfish. Research programs will be exchanged 3 months after the meeting.

(c) Hake and Rockfish Surveys:

A Soviet research vessel will assess abundance of feeding hake and Shelf rockfish species in July-Aug. 1971 along U.S. coasts between 37° and 52° north latitude; in

Aug.-Sept. 1971, it will study biology and estimate relative abundance of hake between 20° and 40° north latitude.

A U.S. vessel will conduct an ichthyoplankton survey in winter 1971-72 to determine spawning hake abundance.

A Soviet research vessel will study in winter 1971-72, between 23° and 40° north latitude, the distribution and formation of hake concentrations during wintering and spawning periods; it will assess spawning stocks by hydroacoustic methods.

The research will be carried out by both sides for years.

(d) Blackcod (sablefish) Studies:

A program to be approved by March 1971 will determine blackcod studies in northeast Pacific--distribution, migration, behavior. The program will be begun in 1971.

Salmon

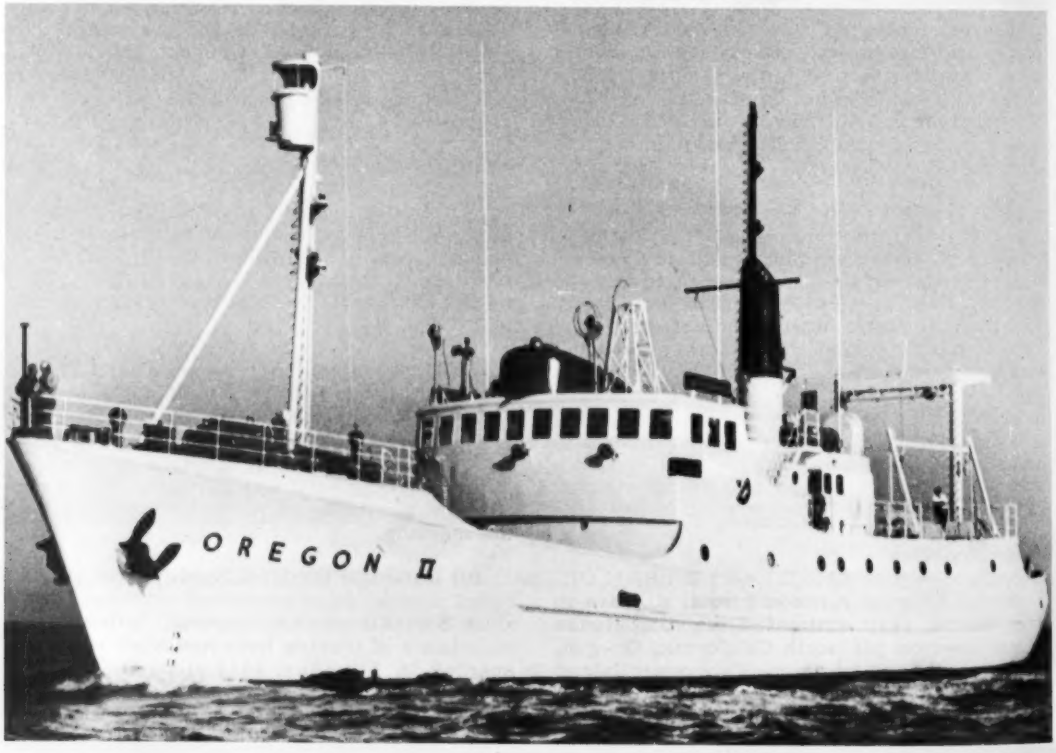
The Soviets denied taking any salmon in incidental catches. They will make available "detailed" catch data--but no vessel logs.

Hake Catch Rates

Preliminary Soviet 1970 data indicate catch per commercial tow from Oregon to Vancouver Island at 1969 level: 4.5-5.5 tons for BMRTs, 4-4.5 tons for SRTMs. By Dec. 1, 1970, the total Soviet hake catch was about 170,700 tons.

The U.S. team was led by D. L. Alverson, Associate Regional Director, NMFS, Seattle. It included Federal and State officials from Washington, Oregon, and Alaska.

The Soviet team, led by P. A. Moiseev, Deputy Director, Soviet Federal Fisheries and Oceanography Research Institute (VNIRO), included representatives of VNIRO and Pacific Fisheries and Oceanography Research Institute (TINRO).



U.S. AND JAPAN CONCLUDE FISHERY AGREEMENTS

Effective Jan. 1, 1971, two-year agreements between the U.S. and Japan extend and modify fishery arrangements between the two for the past several years.

One agreement involves king and tanner crab fishing in Bering Sea, the other fishing off Alaska and the U.S. Pacific Coast.

Crab Fishing

The new agreement on crab fishing reduces Japan's quota of king crab for each of the next 2 years by 56%, from 85,000 cases to 37,500. The change was based on agreement by scientists that previous regulatory measures were inadequate for conservation.

During 1970, Japanese fishermen harvested 18.2 million tanner crabs; this has been lowered to 14.6 million, plus allowance of 10%. The lower limit reflects concern over effect of rapidly expanding fishery on tanner crab stocks.

These measures, new gear in crab fisheries, and continuation of crab pot sanctuary in which no tangle-net fishing will be allowed, should improve conservation and facilitate crab fishing by U.S. fishermen.

Principal changes in the second agreement include:

Closed Areas Off Kodiak

Japan agreed to a 70-day extension of the period during which six areas off Kodiak are closed to Japanese trawling and longlining. The closure will be in effect August 20 through April 30. Under the previous arrangement, Japan agreed to refrain from fishing in these six areas from September 1 through February.

Special Halibut Areas

The closed halibut area in Seward Gully area was divided in two; one will extend northward from present location. The Chirikof area was changed slightly and extended northward.

Davidson Bank Area

Japanese dragnet and longlining will not be permitted between September 15 and February 15 in Davidson Bank area, an important king-crab fishing ground. This change gives Japan an additional month of fishing time, conforming to change in U.S. king-crab season.

Eastern Bering Sea Halibut Grounds

Under former arrangement, Japan agreed to refrain from trawling at night only in a large elongated area during first 12 consecutive days of halibut season. This proved unsatisfactory to U.S. fishermen. So three new separate areas (Polaris, Misty Moon, and Corridor Grounds) were established. Japan agreed to refrain from trawling, both night and day, for first six consecutive days of halibut season in each of these three areas.

Contiguous Fishery Zone, Aleutian Islands

Japan agreed to refrain from trawling and longlining in 3-12 mile zone over much of king-crab fishing area during U.S. crab season.

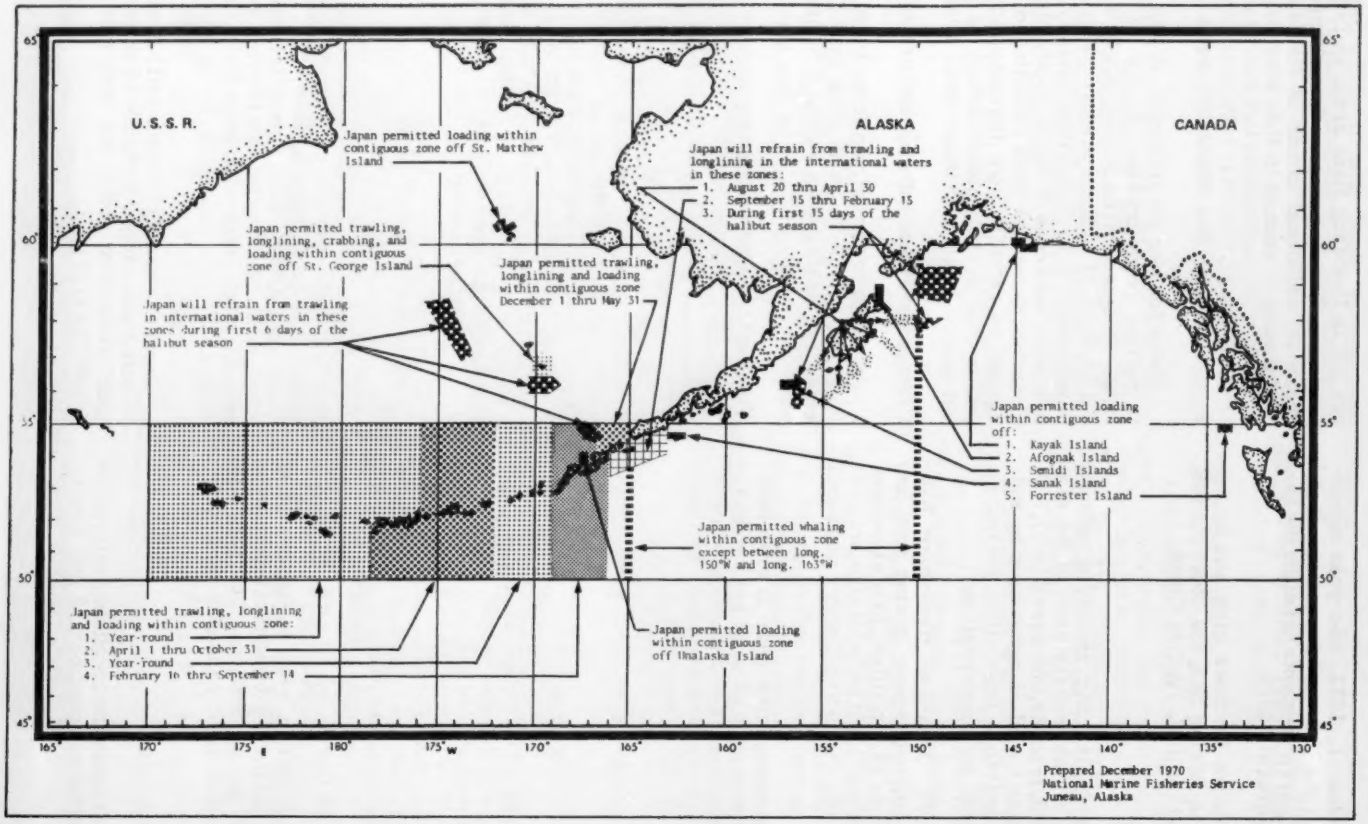
Fishing Off St. Paul Island

Japanese vessels previously fished in 3-12 mile zone off St. Paul Island, the largest and by far the most important fur seal rookery in Pribilof Islands. However, detection of oil spillages, and reports of fur seals with discarded fishing materials, such as pieces of webbing, entwined around their necks, led to agreement that Japanese will refrain from fishing in 3-12 mile zone off St. Paul Island throughout the year in order to protect seals and their environment.

Loading Zones Provided by U.S.

In return for Japanese concessions, the U.S. added three new loading zones to the five granted under former agreement. The new zones are located near Semidi Island (Gulf of Alaska), St. Matthew Islands (Bering Sea), and in a corridor near Makushin Bay, Unalaska Island.

Japanese fishing vessels will be permitted to enter and anchor within 3-12 mile zone to gain protection from the elements and to transfer cargo.


U.S.S.R.
ALASKA
CANADA
Japan permitted loading within contiguous zone off St. Matthew Island
Japan will refrain from trawling and longlining in the international waters in these zones:
1. August 20 thru April 30
2. September 15 thru February 15
3. During first 15 days of the halibut season
Japan permitted trawling, longlining, crabbing, and loading within contiguous zone off St. George Island
Japan permitted trawling, longlining and loading within contiguous zone December 1 thru May 31
Japan will refrain from trawling in international waters in these zones during first 6 days of the halibut season
Japan permitted loading within contiguous zone off:
1. Kayak Island
2. Afognak Island
3. Semidi Islands
4. Sanak Island
5. Forrester Island
Japan permitted whaling within contiguous zone except between long. 150°W and long. 163°W
Japan permitted trawling, longlining and loading within contiguous zone:
1. Year-round
2. April 1 thru October 31
3. Year-round
4. February 16 thru September 14
Japan permitted loading within contiguous zone off Unalaska Island
65°
60°
55°
50°
45°
165° 170° 175° E 180° 175° W 170° 165° 160° 155° 150° 145° 140° 135° 130°
Prepared December 1970
National Marine Fisheries Service
Juneau, Alaska

U.S.-Japan Fisheries Agreements Concerning the U.S. Contiguous Fishery Zone Off Alaska, December 1970.

U.S.-Japan Fisheries Agreement on the U.S. Contiguous Fisheries Zone Off the Pacific Northwest, December 1970.

There were extensive discussions on the condition of bottom fish, especially Pacific Ocean perch and black cod. It was agreed that prudence is required to insure conservation of Pacific Ocean perch. Both countries, acting primarily through International North Pacific Fisheries Commission, will intensify research to achieve more adequate evaluation of this resource. The special arrangement regarding Japanese fishing, and its effect on ocean perch off Washington and Oregon, will continue.

Both nations agreed to seek maximum enforcement of agreements and to prevent pollution by their fishing operations.

The Representatives

The changes were worked out by representatives of the two governments in Tokyo during November 1970. The U.S. delegation was headed by Ambassador Donald L. McKernan, Special Assistant to the Secretary of State for Fisheries and Wildlife. NMFS representatives included Donald R. Johnson, Regional Director, Pacific Northwest region, and Harry L. Rietze, Regional Director for Alaska, other technical experts, representatives of State Governments, industry spokesmen from Alaska, Washington, and California, and a consultant from the International Pacific Halibut Commission.

The Japanese delegation was led by Yoshio Okawara, Acting Director-General of American Affairs Bureau of Japanese Ministry of Foreign Affairs.

King Crab

Tanner Crab
(Chionoecetes tanneri)

Halibut

FISHERY PRODUCTS SITUATION

Donald R. Whitaker
NMFS Current Economic Analysis Division

Demand for fishery products was strong in 1970 as evidenced by rising consumption and rising prices. Per-capita consumption rose 2%--from 11.1 pounds in 1969 to 11.3 pounds in1970. Per-capita consumption rose for the third consecutive year to the highest level since 1953. Prices of fishery products averaged about 10% higher in 1970--nearly double the increase in overall food prices.

Per-capita consumption rose 0.1 pound for fresh and frozen fish and 0.1 pound for canned fishery products. The fresh and frozen trade was marked by strong advances in total consumption of such products as shrimp, salmon, fish sticks, fish portions, and groundfish fillets. Demand for groundfish fillets, particularly cod fillets, was very strong in 1970. Consumption of cod was sparked by the gradual growth in cod fillets marketed through grocery stores and in restaurants--and the fast-growing fish-and-chips franchise chains.

Increased consumption of canned fish was associated with sharply higher production of canned shrimp and canned salmon than in 1969. Production of canned tuna continued its long-run growth pattern.

As 1971 Began

At the beginning of 1971, supplies of most fishery products appeared ample for trade needs prior to the Lenten season. On January 1, 1971, inventories of frozen fishery products were 11% above previous carryover.

Inventories of frozen fillets on January 1 were 17% above a year earlier. Flounder, ocean perch, and whiting fillets were more plentiful; stocks of cod and haddock were below year-earlier levels. Headed-and-gutted whiting will also be plentiful during the early months of 1971. About $2\frac{1}{2}$ times more frozen salmon were in storage than last year. Inventories of frozen fresh-water fish were about the same as a year ago.

Shrimp are expected to be plentiful in early 1971--based on 14% higher stocks in cold storage on January 1. Stocks of crabs and scallops were about the same, while lobster tails were below early-1970 levels.

Fish Sticks, Portions, Blocks

Inventories of fish sticks and fish portions at the start of 1971 were 11% below a year earlier. Stocks of sticks and portions likely will continue below year-earlier levels in the coming months. Inventories of fish blocks, the raw material for sticks and portions, were 29% below 1970.

The present supply situation indicates some tempering of the rapid increase in fish prices that prevailed throughout 1970. Although fish prices will average higher than a year ago, they probably will not match the 10% jump of 1970, especially in the first half of 1971.

1970 ALBACORE LANDINGS TOP 1969's

Preliminary U. S. west coast landings for 1970 albacore season are 55 million pounds (27,500 tons). The 1969 total was 50.5 million pounds (25,250 tons); the 1960-1969 average 45.7 million pounds (22,850 tons). This was reported from NMFS La Jolla, Calif., by R. Michael Laurs, leader, Fishery-Oceanography Group.

At the end of Nov. 1970, a few jig boats were still fishing, weather permitting, off central California, mainly between Monterey and Morro Bay. However, additional catches were not expected to boost significantly the 1970 total.

The higher 1970 landings probably reflect increased fishing effort. The Western Fish Boat Owners Association said more boats fished albacore in 1970 than in 1969.

Preliminary 1970 California albacore landings were 28.1 million pounds, up about 91% from 1969. The aggregate Oregon, Washington, and British Columbia landings were 26.9 million pounds, down about 28% from 1969.

Preliminary landings in millions of pounds by states:

	1970	1969
California	28.1	14.7
Oregon	22.5	29.8
Washington	2.9	3.5
British Columbia	1.5	2.5

Highlights of 1970 Albacore Season

The first reported catches of albacore tuna in 1970 were made by NMFS 'David Starr Jordan' on a preseason scouting cruise off California and Oregon, June 22-July 2. Three albacore were taken near San Juan Seamount; about 100 were taken between Point Sur and Point Arena, about 300 miles offshore.

The albacore price settlement of $550 per ton delivered to canneries was reached on July 15. The season started fast, with good fishing in Eureka-Crescent City area. Smaller catches were made off central Oregon. However, good fishing off northern California lasted only a few days as high winds and seas developed. By July 20, the fishery had moved north.

Off Oregon

The best fishing since 1967 was reported off Oregon during last week of July. Landings in Astoria were at record rate. Although 1970 season started 15 days later than 1969, July landings were well over double those in July 1969. However, after almost-record landings of nearly 4,000 tons for July, the albacore jig fishery off Oregon collapsed during first week of August. It was unexpected and abrupt. The fishery did not revive.

Despite large-scale scouting during first week of August, fishermen failed to get back on the fish in offshore area from southern Oregon to Vancouver Island. However, on August 5, indications of good fishing and fair weather were found off northern California. Unfortunately, the traditional windy weather there resumed and caused most of the fleet to return to Eureka by August 9. High winds and sloppy seas seriously hampered fishing. By August 11, part of the fleet returned to sea off northern California and reported good fishing in rough weather.

Southern California

While albacore fishing off Oregon ebbed during first-half August, it increased off southern California to best level in about 3 years. A small fleet began fishing near the 213 fathom spot off San Diego during first week of August. It averaged about 100 fish (mostly 20-25 pound) per day; some single day scores were as high as 250 fish. Fishing continued at this level, mostly by small bait boats, for about a month. Landings in San Diego were highest in several years.

Excellent jig fishing was reported on August 18 in area near compass rose outside San Juan Seamount: some 1,000 fish scores and many 600 fish scores. A large fleet of jig boats quickly gathered from Rodriquez Dome to San Juan Seamount to about 80 miles southwest of Point Arguello. Good fishing on 11-15-pound albacore continued for about a week. Catches averaged 250-300 fish per day. But by August 25, because of poor fishing and high

winds, most of fleet moved northward to Point Arena and San Francisco.

Off Oregon & Washington

By mid-August, most larger California bait boats were fishing off Oregon and Washington. The best catches were made during September: some days several boats reported 20-25 tons per day. However, for the most part, bait-boat fishing in northwest was only fair; catches ranged from 2-10 tons per day.

Rough weather along central and northern California prevented jig fishing in any one area for more than a few days during first-half September. A few larger jig boats were able to fish during rough weather. But most boats were locked into ports from Eureka to Morro Bay during greater part of this period.

Off Central California

Excellent jig fishing developed in a large area off central California during third week in September. The main activity was centered near and outside Monterey Seavalley. Good catches also were reported about 30 miles southwest of Point Sur and outside Davidson Seamount. High winds and rough seas slowed fishing for a few days during third week of September. Most boats were forced into central California ports. As winds abated, the large fleet quickly got back on fish. By Sept. 26, excellent fishing, associated with fair weather, was reported from Morro Bay to Point Arena. Fair weather during third week of September also allowed very good fishing in a large area about 80 miles offshore between Cape Mendocino and Eureka. However, by September 22, most boats had left northern California waters because of high winds and lack of fish.

During first 2 weeks of October, the catches off northern and southern California declined. Fishing effort was narrowed to central California region (off San Francisco, Monterey, and Morro Bay). Most bait boats fishing off Oregon and Washington moved to California waters to end their season. The season was essentially over by second week of November, but a few boats still were catching small numbers of fish, mainly between Monterey and Morro Bay, at end of November.

Jordan's Cruise

The David Starr Jordan conducted an 18-day albacore-oceanography cruise in October. The purpose was to investigate migration route followed by albacore leaving American west coast near end of fishing season. Data were collected to determine if albacore migrate out of American fishery along boundary of transition zone between north Pacific and central Pacific waters.

The cruise had two parts. In Part I, Jordan made a rapid north-south oceanographic transect between latitudes 35-43° N. along longitude 140° W.; the resulting data were analyzed aboard. In Part II, standard techniques were used to make detailed fisheries investigations in north Pacific, central Pacific, and transition zone indicated by environmental conditons during Part I. Part II included trolling 12 jig lines during daylight and observing the life history of albacore tuna by study of gonads, stomach contents, liver, and other vital statistics. Oceanographic observations were made during night hours to measure distribution of environmental characteristics associated with migration of albacore and season's end off American west coast.

Findings

Sea-surface temperatures measured were very near or above upper limit of optimal temperature range for albacore in all waters, except subarctic waters. Albacore were caught only in subarctic waters (six landed and five lost); small numbers of dolphinfish, Coryphaena, were caught in transition zone and north Pacific central waters. Albacore were migrating along a route associated with their optimal temperature range, rather than along a boundary between water masses. Fishing effort was limited (8-12 lines fished 13-24 hours in each water mass) due to rough weather and other reasons, and catches of albacore were small. So the results were inconclusive.

'KELEZ' CONDUCTS SALMON RESEARCH FISHING CRUISE

The 'George B. Kelez' of the National Marine Fisheries Service (NMFS) left Seattle, Wash., January 12 for a 7-week winter salmon research cruise in the North Pacific Ocean. The expedition members will fish from 49° N. to 53° N. along 160° W. and 165° W. and from 166° W. to 176° W. between 50° N. and 51° N. They are using monofilament and multifilament nylon gill nets of various mesh sizes. About 3.3 km of gear are being fished nightly. Oceanographic observations include daily bathythermograph and continuous surface salinity readings.

Cruise Purpose

The cruise is part of continuing research on the ocean distribution of salmon. It is being carried out for the International North Pacific Fisheries Commission. Purpose of the fishing is to obtain an index of abundance of maturing Bristol Bay sockeye salmon in the northeastern Pacific. When this is compared with indices obtained during past winter cruises, it will aid in forecasting the 1971 salmon run to Bristol Bay.

Bristol Bay Sockeye

Bristol Bay sockeye salmon are one of the most important U.S. salmon resources. In 1970, the run (catch and escapement) was close to 46 million fish; of the total, about 22 million were caught commercially. The commercial catch was worth about $26 million to fishermen.

This species is distributed widely and part of the run is caught each year by the Japanese mothership salmon fishing fleet.

Westward to Mid-Aleutians

Besides the research in the northeastern Pacific, operations will extend westward as far as Adak in the mid-Aleutians. The distribution of maturing Bristol Bay sockeye salmon will be investigated near the Tripartite Convention (Canada, Japan, U.S.) abstention line at 175° W.--before Japanese fishing begins in the spring.

Data collected by NMFS biologists will identify catch by species for each mesh size, and for length and weight of the salmon. Scale samples will be collected. Pituitary and blood samples will be used for racial and maturation studies. Frozen whole salmon will be returned to the NMFS Seattle laboratory for additional studies.

--Robert R. French
NMFS Biological Laboratory
Seattle, Washington

1970 OREGON COHO CATCH WAS WEIGHT RECORD

In 1970, Oregon troll salmon fishermen landed almost one million coho weighing 8.7 million pounds, a single-season record, reports Oregon Fish Commission. Although more fish were caught in 1967, their total weight was below 1970 catch.

Trollers also had a better-than-average chinook catch of 1.9 million pounds worth $5.9 million.

Over 50% of Hatchery Origin

Fish Commission studies in 1969 showed that over 50% of coho caught in Oregon troll fishery were of hatchery origin. About 90% of these hatchery fish came from Oregon, Washington, and Federal hatcheries on Columbia River; the remainder came mostly from Oregon's coastal river hatcheries.

The high percentage of hatchery-reared coho caught by Oregon trollers in 1970 reflects increasing success of hatchery programs, the Fish Commission states. The 1970 returns of jack coho salmon to Columbia River hatcheries indicate 1971 coho season will be another good one.

ANCHOVY FISHERY PASSES MIDPOINT TOWARD QUOTA

About 15,000 tons of anchovy were delivered to Terminal Island reduction plants during Dec. 1970 by the southern California anchovy mackerel fleet. Fishing was mostly good, but much fishing effort was lost because of storms off California and the holiday season.

Landings through Dec. 1970 were 58,884 tons--about 54% of 110,000-ton quota for season ending May 15, 1971.

MERCURY RESIDUES SHARPLY AFFECT U.S. IMPORTS FROM JAPAN

The U.S. Food and Drug Administration's findings of high mercury residues in seafoods have seriously affected U.S. imports from Japan and other suppliers, reports NMFS Terminal Island, Calif.

When FDA acted to remove all contaminated canned tuna from market, U.S. West Coast and Puerto Rican tuna packers stopped importing it. This virtually ended frozen-tuna purchases from Japan, South Korea, and Taiwan.

The Federation of Japan Tuna Fisheries Cooperative Associations began to buy and store tuna catches (at first, albacore) returned to Japan until mercury problem is solved.

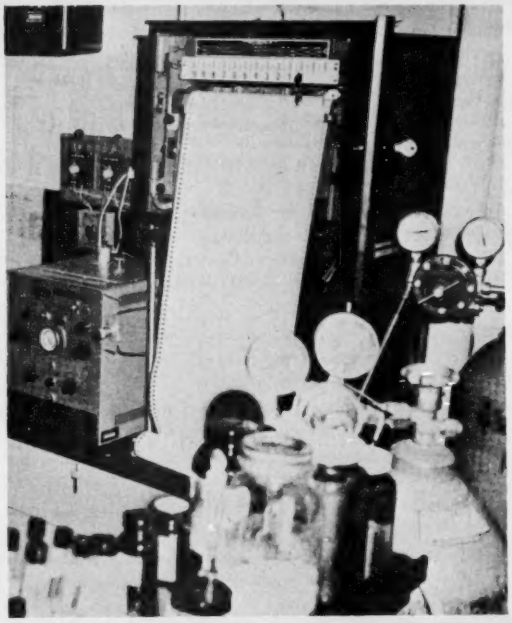
Swordfish Steaks Recalled

FDA then began large-scale recall of swordfish steaks. This just about shut door to shipments from Japan, a major supplier.

DDT LEVEL INCREASES IN LANTERNFISH

Lanternfish, or myctophids, are perhaps the most widely distributed fish throughout the oceans of the world. They are the principal forage fish of other species. Since CalCOFI cruises began in 1949, they have been caught often in night plankton tows and by dip-netting.

In recent months, NMFS has run a few of them through the gas chromatograph for DDT analysis. Biologists say these fish go through digestion, separation, and clean-up procedures a little better than other elements of plankton; also, they tend to have higher values of DDT if the pesticide is present.



Gas chromatograph identifies and estimates trace quantities of pesticides--as small as parts per trillion.

Results of Analysis

The results show that lanternfish taken in 1970 from about same area off southern California have high values; the values for these fish taken in 1950 were zero.

Available also for comparison with rest of plankton samples are lanternfish taken from frozen plankton samples.

□□□□□□□□

ALASKA

1971 DROP IN ALASKAN SALMON PREDICTED

Alaska's 1971 salmon harvest will drop to about 41.5 million fish--20% below the 1960-69 annual average of 51 million fish and about the same as 1950-59 average of 41 million. This was predicted by the Alaska Department of Fish and Game.

By statistical region, biologists are predicting a catch of 7.85 million salmon in southeast Alaska, 21.69 million in central Alaska, and 11.92 million in western Alaska, which includes Bristol Bay.

Biologists Optimistic

However, biologists remain optimistic about the future of Alaska's salmon fisheries. They cite rapid recovery of important salmon-producing areas in Prince William Sound hit hard by 1964 earthquake, and increasing trends in recent odd-year pink salmon runs in southeastern and Kodiak fisheries. Another major factor is good escapements in Kvichak River in 1969 and 1970. This reflects Fish and Game's management strategy to return major Bristol Bay sockeye fishery to pattern of two or three good years in every five-year cycle, rather than a single good year per cycle.

INDUSTRY SUGGESTS SHRIMP QUOTA FOR KODIAK

Processors and fishermen believe that Kodiak-area production of pink shrimp may exceed 100 million pounds in 1971, especially if plans to increase processing capability at Kodiak are carried out. This was reported by NMFS Juneau. Besides the four plants now processing shrimp, four others are tooling up. Around 20 peeling machines are expected to be added to the present 18.

Quota Recommended

The Kodiak Advisory Committee, concerned about overfishing, has recommended that the Alaska Department of Fish and Game establish a quota of 50 to 60 million pounds for shrimp trawled from the three major Kodiak fishing areas. The committee hopes this would encourage fishing on grounds not now fished much.

LIVE ALASKA CRABS FLOW STEADILY TO HAWAII

Shipments of live Dungeness crabs from Homer, Alaska, have steadied at about 4,000 pounds a week. About half is shipped to Honolulu, the remainder to Portland, Oregon, A test shipment of live crabs from Anchorage to Honolulu via Los Angeles soon will be made to meet request of Hawaiian brokerage firm. Its purpose is to see if shipments can arrive mid-week in Honolulu.

SALMON ROE MARKET IS EXPANDING

Japanese demand is stimulating production of cured Alaska salmon roe. In 1967, Alaska produced 3,000 tons. Preliminary 1970 estimates indicate production between 5,700 and 5,800 tons, almost double 1967 figure.

The increase has been accompanied by greater Japanese acceptance. Roe produced during past season was considered by Japanese comparable in quality to that produced on Japanese motherships.

Salmon roe being processed at an Anchorage, Alaska, cannery. (BCF-Alaska photo: J. M. Olson)

PACIFIC WHALE WATCHERS ARE AT THEIR POSTS

The annual migration of the gray whales is under full steam. The 6,000-mile trip reaches from the Arctic Ocean and Bering Sea to the warm lagoons along the Baja California coast of Mexico. There, the whales mate and calve.

In December, January, and February, the movement of whales southward along the California coast attracts many watchers. The whales' closest approach to shore is off the headland at San Diego's Point Loma--and a little past the kelp beds at nearby La Jolla.

Fig. 1 - Spouting whales.

And, each year, about 350,000 persons watch the spouting and cavorting whales from a reviewing station of the National Park Service at Point Loma's Cabrillo Monument. Thousands of other whale watchers follow the migrations in excursion and private boats.

Going & Returning Whales Meet

The procession of whales will continue until late February or early March. At that time, whales that started their trips late--many of them mothers with recently weaned calves--will encounter the first returnees from sheltered inlets on Mexico's coast.

Whales usually spend 2 months at their mating and calving grounds. The 12,000-mile round trip takes 5-6 months. Average speed of a whale is 4 knots; a day's travel covers about 40 miles.

Recover from Near-Extinction

The gray whale was almost extinct before a 1937 international convention outlawed killing it. The herd increased steadily from that time until the present 8,000-10,000 head. This is estimated to be about 20% of the number that existed 100 years ago--when California's great whale slaughter began.

Fig. 2 - Spectators at whale watching station at NPS Point Loma's Cabrillo Monument. (Photos: National Park Service)

Marine biologists believe the gray whales have become more wary. They stay farther from shore to avoid humans. When they begin to return in late February, they will increase their distance from shore to protect their young.

Move Farther South

For years, the main destination of the whales has been Scammons lagoon, 325 miles south of San Diego on the Pacific coast of Baja California. In the last few years, however, as more people have moved into this area, the whales have moved farther south.

WATER POLLUTION KILLED 41 MILLION FISH IN 1969

Water pollution killed an estimated 41 million fish in 45 States in 1969, announced William D. Ruckelshaus, Administrator of the Environmental Protection Agency (EPA), in releasing the 10th annual fish-kill report in January.

The report was prepared by EPA's Water Quality Office (formerly Federal Water Quality Administration) in cooperation with the reporting States.

The 1969 fatalities were an increase of 170% over about 15 million fish that died in 42 States during 1968.

Ruckelshaus said: "These figures point out quite strongly the need for stricter safeguards to keep dangerous and hazardous materials out of the Nation's rivers, lakes, and streams."

Fish-kill census-taking began in June 1960. Since then, 144.6 million fish have been reported killed in more than 4,200 separate incidents. The record increase reported in 1969 can be connected partly to greater State cooperation, "to improved reporting practices, to greater public attention to fish kills, and to an unusually large single kill."

Industry Most Responsible

The largest single pollution-caused fish kill reported was 26.5 million fish in Lake Thonotosassa at Plant City, Florida. For 15 years before the kill, effluent from industrial and municipal sewage treatment had entered the lake untreated. Nutrients in the wastes reduced oxygen in January 1969 to level that resulted in death.

Fig. 1 - Pensacola, Florida: State Marine Patrol boat cruising through millions of dead menhaden in early Sept. 1970, after one of the Escambia Bay's biggest fishkills. It was 31st major fishkill reported in the Bay in 1970 (21 kills in 1969). The officer described scene as looking "like snow." The kill was caused by deoxygenation of the water; its victims were mostly 6-inch menhaden. (Photo: Mike Albertson, Pensacola (Fla.) Journal)

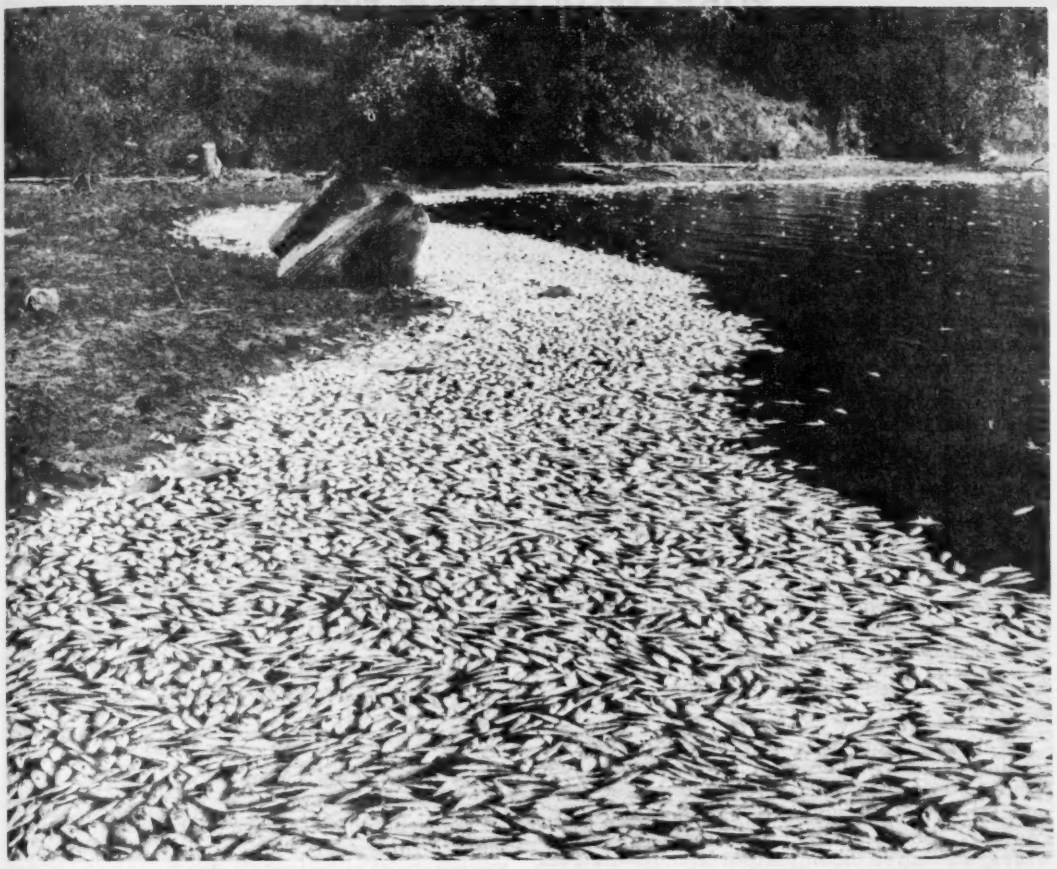


Fig. 2 - The bank of an Illinois stream carpeted with victims of a large fishkill in August 1967. Carp and other "rough" species were among victims. (Water Quality Office, EPA)

In 1969, industrial operations produced the highest number of incidents and fish mortalities: 199 cases of industrial pollution resulting in 28.9 million dead fish. Municipal pollution, which had killed most of the fish in 1968, 7 million, killed the fewest in 1969--1.2 million.

Only two States--Nevada and North Dakota--reported no fish kills. There were no reports from Maryland and Mississippi.

Preparing the Reports

The annual fish-kill reports are received from cooperating State fish and game and pollution-control agencies. The reports are prepared in cooperation with Interior Department's Bureau of Sport Fisheries and Wildlife.

Copies of "1969 Fish Kills" may be purchased for 20 cents each from Superintendent of Documents, Washington, D. C. 20402.

WATER-QUALITY DROP IN UPPER GREAT LAKES THREATENS NATIVE FISH

The continuing deterioration of water quality in the upper Great Lakes is the greatest threat to replenishment of sturgeon, whitefish, lake herring, and other native fish, Stanford H. Smith reported to the American Association for the Advancement of Science in Chicago on Dec. 28, 1970.

Smith is associated with the Great Lakes Fishery Laboratory, Bureau of Sport Fisheries and Wildlife, and with the University of Michigan.

If thermal and chemical pollution cannot be halted, he said, "the massive undertaking to restore the fishery productivity of the upper Great Lakes may, in the end, prove futile." Already, water contamination has reduced or eliminated native species in Lakes Erie and Ontario. Lakes Michigan, Huron, and Superior "could follow successively during the next few decades if appropriate corrective measures are not implemented expeditiously."

Reasons for Decline

Water contamination by the logging industry and intensive fishing during the late 1800s contributed to the steady decline in native fish populations in the upper Great Lakes. More recently, Smith added, the increase of alewives, a species incompatible with the native fish, has led to "fluctuating fishery productivity."

Smith explained: "The alewife is wide-ranging, dense-schooling and active-feeding--attributes that are essential for its survival in the ocean. In the confines of a large lake, however, it ranges widely and competes strongly for space and food with virtually all other species at various times of the year."

Fish & Fishermen Decline

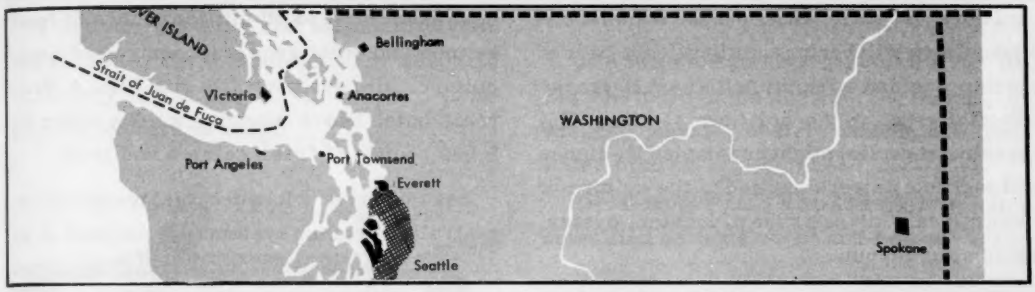
Reduced fish productivity led to a 95% decrease in the number of commercial fishermen in the upper three lakes between 1885 and 1965.

The U.S. catch there declined less, from 44 to 40 million pounds. But the species caught in 1965 were mostly nonnative, low-value fish, such as alewives, carp, and smelt.

Cool, Clear Water Needed

Smith noted that native species in the upper lakes "thrive only in cool, clear water." Thermal and chemical wastes "can only make the lakes less favorable for them." Also significant is the fact that species that prefer the coldest temperature were the first to decline. "This relation may mean that factors contributing directly or indirectly to temperature increases are, in essence, pushing the lakes climatically southward. If not abated, such changes may push the lakes beyond the ecological zone in which the native species capable of maintaining stability and high productivity could thrive."

LUMMI INDIANS' AQUACULTURE PROJECT NEARS COMMERCIAL PRODUCTION



The Lummi Indians, who live near Bellingham, Washington, are progressing toward commercial aquaculture. During the past year, in the first phase of their project, they built four acres of research ponds to prove the project's feasibility. Now they are beginning the second phase--commercial production in a complex of ponds that will total 750 acres. On a long tidal flat, where two miles are exposed at low tide, they have begun to dike and flood the tidelands--and let the high tide change the water behind the dikes.

1970's Achievements

In March 1970, the Lummis introduced into the first ponds oyster seed attached to suspended shells. Fed on plankton that multiplied quickly in the sun-warmed waters behind the dikes, the oysters grew rapidly. By fall, some of the crop was ready for market, far ahead of conventionally grown oysters.

Sharing the ponds with the oysters were 4,000 of the famed super rainbow trout bred by Dr. Lauren Donaldson of the University of Washington. Trout that weighed only 10 to a pound when planted reached 5 pounds each by fall. Also, baitworms were harvested from the pond bottoms.

First Oyster Hatchery

In a separate area, the Lummis built the first oyster hatchery in the Pacific Northwest. They overcame substantial technical problems in raising oyster larvae that commercial growers import annually from Japan and Korea.

Much Interest & Support

This project, directed by Dr. Wallace G. Heath, has attracted wide interest and support. About $500,000 in Federal, state, and private financing went into the first phase. The Economic Development Administration of the Commerce Department has granted $1.5 million toward construction of the second phase. Also, the Oceanic Foundation of Hawaii, a nonprofit research organization, provided $100,000.

The Lummi Council estimates that aquaculture could create 500 new jobs within the next decade. Beyond this, the lessons learned will have wide application--in the U.S. and elsewhere. The Council feels that production of food from the sea will increase with the application of new knowledge of feeding, breeding and, possibly in time, the application of waste heat from thermal power plants.

COMMERCIAL AQUACULTURE IN NEW ENGLAND IS YEARS OFF

There is little chance that commercial aquaculture will become a significant part of the New England economy in the next 10 years, especially not in the northern section. But investment capital might be tempted if science and technology were applied to the culture of 'luxury seafood'--shrimp, lobster, oyster, salmon, and trout.

This was the consensus of the 80 persons representing industry, government, and universities who, in Oct. 1970, looked critically at present and potential aquaculture in New England. The 3-day meeting, held at the University of New Hampshire, was sponsored by the Research Institute of the Gulf of Maine (TRIGOM), a group of Maine universities, and funded by New England Regional Commission. The meeting was reported by the New England Marine Resources Program in Dec. 1970.

What They Discussed

The participants acknowledged rapid developments in aquafarming methods. They noted that supplies of luxury stocks from natural sources have been erratic. Major firms working to achieve commercial aquafarming include: Armour, Corn Products, Co., Ralston Purina, Monsanto, United Fruit, Inmont, International Paper, and Minnesota Mining and Manufacturing. The work is not going on in New England.

How Nova Scotian Firm Operates

P. E. Cavanagh, the engineer-head of Sea Pool Fisheries, Lake Charlotte, Nova Scotia, said that already he is looking forward to annual sales of 40 to 50 million pounds of fresh salmon and trout grown in controlled aquaculture. His sales profits run 30%. A Montreal hotel has a standing weekly order for 5,000 pounds of fresh salmon and trout.

Sea Pool uses "closed-cycle, temperature-controlled rearing systems for culture of all the life stages of trout and salmon. Facilities include pools that can be filled with sea-water, surface fresh water, spring water, or any combination of the three."

Water is aerated continuously. Air-lift pumps recirculate it through limestone filters. When necessary, heat is added to the water from waste heat of an oil-fired power plant.

"The rearing pools allow for conservation of water, removal of organic wastes (particularly the nitrogenous ones), lower heating costs, and make possible more efficient general control of the environment."

Cavanagh said operations on land eliminate many socio-legal problems because the facilities "don't get in the way of other people."

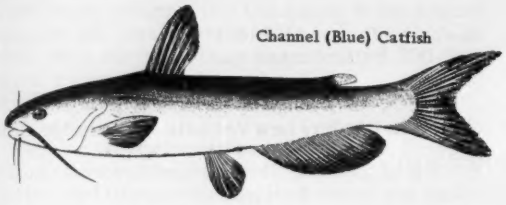
He had considered an aquacultural enterprise along U. S. east coast. But a review of water data, especially temperatures, ended the idea.

Species Evaluated for Culture

Thomas A. Gaucher, a natural resources consultant, chaired the conference's panel on technology. His group evaluated some species as possibilities for culture in New England.

The species were grouped according to present technical capability:

• Catfish, oysters, and salmonids (trout and salmon): There is advanced or adequate technology to culture all life stages. Commercial operations exist.



Channel (Blue) Catfish

• Scallop, mussel, prawn, and shrimp: There is advanced or adequate technological development, but species depend on nature for some life stages. Some commercial activity exists.

Shrimp

• Pompano, spiny lobster, American lobster, abalone, plaice, sole, and turbot: These require advanced technological development and some basic biological development.

• Barnacle, sea urchin, bait worm, seaweed, crab, conch, and tuna: Require technical development from a more basic standpoint. Also, basic biological work needed before decisions can be made on suitability for commercial production.

The most promising candidates for New England cultivation include: salmonid, bay scallop, mussel, oyster, quahog, and freshwater prawns.

Dr. Gaucher said aquafarming can be classified as 'extensive' and 'intensive':

• "Extensive cultivation normally involves large areas, low management, low capital cost, low operating cost, and low yield on a unit area basis." Examples would include coastal embayments, sluggish ponds, and open sea culture.

• "Intensive cultivation generally utilizes small production units, intensive management, dense stocking, force feeding, and stock selection and manipulation." This involves a "high capital cost, high operating cost, and produces a high yield per unit area." Examples include "raceway culture, lentic ponds, power plant effluents, rivers, some intertidal sea locks, zones of upwelling, and coastal embayments with high tidal exchange."

Intensive Approach More Promising

The intensive approach likely would yield best results in early aquaculture progress in New England, Dr. Gaucher said. This is because method can minimize dependence on nature. So uncertainties and risks would be reduced--and correspondingly, system's "reliability, output, and profit potential" would be increased.

GLOUCESTER FISHERMEN AIDED BY WOMEN'S GROUP

The women of Gloucester, Mass., one of America's oldest ports, have organized to help their fishermen kin. More than 150 wives, widows, and daughters founded the United Fishermen's Wives Organization of Gloucester (UFWG) over a year ago to speak for fishermen. UFWG then formed a fishing cooperative designed to set fair prices for fish from member boats, reports 'New England Marine Resources Information'.

The group has incorporated as Gloucester Fresh Fish, Inc., and is trying to raise $300,000 to do its job.

Industry Decline

UFWG secretary, Mrs. Grace Parsons, says there are never fewer than 1,200 unemployed in Gloucester, population 27,000. She claims unemployment is tied to decline of fishing industry.

She explains why her group is working for the rebirth of the industry: "In 1966, the industry was still the third largest employer in the city, paid the third highest wages, offered tourist appeal, and calculations showed that every two jobs in fishing created one job in other activities."

Mrs. Josephine DiLiberti, new group president, emphasizes the human and moral elements motivating their work--"the indissoluble ties of fishing with roots and tradition of Gloucester, whose natural harbor attracted the English, Portuguese and Italians from continental shores."

She adds: "It's disheartening, discouraging and dislocating to see the fishermen put in long hours and hard work for pay that can't support them or their families." Mrs. DiLiberti cites haddock selling at $1.39 per pound retail, while the fishermen get only 25 cents. "We'll be the fish dealer now under the new cooperative and pay the fishermen a higher, fairer wage."

Seeks to Increase Fleet

A main objective of the coop is to enable fishermen to buy new vessels or enlarge fleet through coop loans.

The coop hopes to cut sharply the fishermen's insurance fees, which now are 25% of a year's expenses. It will regulate its own members and so lessen disputes that now exist between fishermen and insurance agency. The former complain of "blackballing"; the latter of "faulty claims".

1971 Building Plans

Construction of the coop will begin in spring 1971, says Mrs. Parsons. A 40 by 60 foot, prefabricated steel structure will be built at the end of a filled wharf in the downtown area. The space was made available through urban renewal. More than 20 boats can be docked at the wharf. The coop will lease the wharf for $180 per month, "with option to buy".

Processing Unit Later

At first, the coop will be fish dealer only. Then a processing unit will be put in. Eventually, buying, selling, and distributing will be handled completely by coop.

'GLOMAR CHALLENGER' REPLACES DRILL BIT 3 MILES DOWN

The drilling research vessel 'Glomar Challenger', operating in water 13,000 feet deep in the Caribbean Sea's Venezuelan Basin, recently replaced a worn drill bit. The expedition members achieved this after drilling 2,300 feet, reentering the same 5-inch bore hole at the sea bottom with a more than 3-mile drill string. They then drilled 200 feet more to recover chert, hard limestone, and crystalline rocks for the first time.

The re-entry technique of National Science Foundation-sponsored Deep Sea Drilling Project is used to recover ancient deep-sea sediment. The success was announced by scientists and engineers of Scripps Institution of Oceanography, University of California, San Diego.

This was the second re-entry achieved by the Deep Sea Drilling Project. The first was off the U. S. East Coast on June 14, 1970, in 10,000 feet of water.

The Second Re-Entry

The Project scientists have recognized that many scientific objectives lay beyond the reach of the drill string because even the sturdiest bits would wear out in resistant areas. But with the first re-entry achieved, they chose a site near which previous drilling had to be aborted: in the Caribbean Sea, at 15°07' North Latitude and 69°23' West Longitude, about half way between Venezuela and Puerto Rico.

There, a beacon was dropped to the ocean floor as a reference point for maintaining position while drilling. Then 160 feet of $13\frac{3}{8}$-inch diameter casing were attached to a 60° cone 16 feet in diameter at top, 13 feet high, and with 3 acoustic reflectors spaced equidistantly around its top. The cone and casing were attached, in turn, to the drill pipe with the core bit; the entire assembly was lowered to sea floor. The casing was pressed into the sediment leaving the cone at sea floor. Then the drill pipe was released mechanically from the cone and casing assembly. A normal drilling-and-coring operation was conducted through soft sediments to 1,300 feet below the sea floor, where harder rocks, 45 million year old, were encountered.

After more drilling, the tungsten carbide bit was spent. It was withdrawn from the limestone and chert at 2,300 feet, and pulled back to derrick floor. A new core bit was installed on the drill pipe at derrick floor and lowered to within 30 feet of ocean floor. A transducer, which emits and receives a high-frequency sound, was lowered on conductor cable through the 5-inch-diameter drill pipe to extend 6 inches below core bit. The transducer scanned the ocean floor with 360° rotation and emitted a high-frequency sonic beam, which the cone reflected back. The cone was first located 300 feet from the drill pipe. As the scanner sent out sound pulses and listened for echoes, the engineers on ship's bridge directed the hunt on an illuminated screen, like that used with a radar set. The 10,500-ton vessel was moved toward a series of reflectors that characterized the cone, a very precise maneuver.

Drill Pipe Lowered

When the Glomar Challenger was centered over the cone, the drill pipe was lowered. At first the expedition members thought it had re-entered the old hole. However, after drilling 300 feet, they concluded it had missed the re-entry cone. A new hole was drilled. A 30-foot core confirmed their conclusion.

The core bit and drill pipe again were positioned 20 feet above sea floor and sonic transducer lowered into place. The re-entry cone was located about 90 feet from drill string, and the vessel again was maneuvered directly above cone. This time the drill string was lowered to make a successful re-entry. As the core barrels were opened on ship to expose their long columns of undisturbed rocks, they were examined immediately by scientists. The tiny fossils were examined under microscopes to answer immediately the all-important question of age.

Value of Achievement

Dr. N. T. Edgar of Scripps and J. B. Saunders of Texaco Trinidad, co-chief scientists, said: "The whole column of rocks discovered is of prime interest, but the presence of basalt at the bottom of the hole can be considered especially so. The existence of such relatively young rock of this type formed by melting may cause geologists to revise their theories as to the age of the Caribbean Sea."

The Project scientists believe that reentry is now a workable tool. It will be of great value to the Deep Sea Drilling Project and for the economic exploration of the deep ocean floor. With improved drilling bits and capability to change them, there is a much better chance of drilling deep holes where the need for information is greatest--in the ocean basins.

15 U.S. SHIPS STUDY DEEP OCEAN & COASTAL WATERS

About 880 scientists, technicians, and crewmen aboard 15 Commerce Department ships have begun a nearly year-long study of the waters that splash the U.S. shores.

They will sail from Alaska to Hawaii and the South Seas, traverse the Atlantic to Africa, to the Caribbean and Gulf of Mexico, and up and down the Atlantic and Pacific coasts.

"They will probe the oceans, including the land beneath and the air above, the coastal waters and estuaries of the United States, the submerged continental shelves, the wrecks that dot America's shores and the treacherous currents that endanger seamen and their craft."

Their Missions

The scientists will study the mysterious internal wave undulating below the sea's surface. They will probe, too, the mountains, ranges, canyons, and massive fractures in the earth at the sea bottom, and the unseen ocean 'rivers'. They will seek new evidence of the movement of continents and the spreading of the sea floor.

While the larger vessels are conducting these activities, the smaller ones will conduct "marine charting surveys, measuring the currents along the coasts and in estuaries, bays, and harbors and scouring the coastal sea lanes for submerged wrecks, pilings, abandoned oil derricks, and other dangers to sea commerce and recreational boating."

PLAN CONTINENTAL-SHELF LAB OFF TEXAS

A 13-member committee is planning a continental-shelf laboratory off Texas.

The committee, led by Dr. W. H. Clayton, Texas A&M, is sponsored jointly by Texas A&M and the University of Texas Medical Branch at Galveston. Dr. Clayton said its primary concern will be to determine the benefits to the state from the laboratory complex. "Development of a continental shelf laboratory has been a goal of Texas A&M since the publication of the President's Commission on Marine Resources and Engineering Development report in 1969. The Galveston Chamber of Commerce has stimulated recent activity through its long-range planning for development of the State's marine potential and through its plans for a 'Texas Tektite' program."

Many Groups Involved

The lab would support a broad program. Most of the research would center on ocean and environmental science, including pollution and water-quality studies.

About 30 percent of the program would deal with man-in-the-sea and biomedical research. Texas educational and research institutions, supported by industry and government, would cooperate in the lab's efforts.

Feasibility Study

Texas A&M recently published a preliminary feasibility study of a possible site for an offshore lab through its NOAA-sponsored Sea Grant Program. A permanent lab in the Flower Gardens coral reef area, 110 miles off Galveston, was called technically feasible. The report stated that a permanent lab would offer unique research opportunities for a

short time; however, it questioned whether scientific results can justify high costs of a permanent lab on one site. Initial costs would be $3-4 million.

Dr. Clayton explained: "One of the tasks of the study committee will be to explore the possibilities of using platforms, submersibles, habitats, and such facilities as a floating semi-submerged instrument platform patterned after the Navy's FLIP ship. It is technically possible to construct a facility in the Flower Gardens area. We simply must ask ourselves what kind of facility we need and what we hope to accomplish through the use of it."

SURVEYING THE WORLD'S CORAL REEFS

"Nowhere in the ocean are divers provided a greater panorama of underwater life than around the world's coral reefs," states 'Sea Grant 70's', published by Texas A & M University. Divers from the University of Hawaii and Texas A & M are conducting Sea Grant studies in these coral communities.

Seven Sea Grant researchers are diving in the Kaneohe Bay Reef area off Oahu to learn more about the dynamics of reef growth. The researchers include oceanographers, zoologists, geologists, and botanists. The results will help in management and stimulation of reefs affected by man's activities or natural disasters.

What Researchers Are Doing

The diver-scientists are transplanting corals and other reef organisms to determine which are most adaptable to unfavorable conditions, such as major sewer outfalls that occur at the reef's southern end. They will try to regenerate large reef areas killed by pollutants, fresh water, and other causes in Hawaii and the trust territories.

In Gulf of Mexico

At Texas A & M, Sea Grant supports research in Gulf of Mexico's Flower Gardens reef area, about 125 miles off Texas. Diver-scientists are conducting biological, acoustical, engineering, and geological research.

A feasibility study is underway to determine whether a permanent underwater research laboratory should be established in the area. The researchers are studying economic potential of sediment beds around the reef, which caps a large salt dome; testing durability of various substances; and sampling soil.

Twelve graduate students in biological and geological oceanography made an underwater field trip to coral reefs off Mexico's Yucatan Peninsula.

RECOVERING UNDERSEA TREASURES

Until the last few years, underwater salvage techniques remained much the same as those used in 1939 to raise the U.S. submarine 'Squalus' from 240 feet, reports 'Sea Grant 70's'.

Conventional methods have used dewatering by pumps, dewatering by air, and lifting devices. Polystyrene and polyurethane foams to obtain the desired buoyancy have become increasingly popular because these are relatively low-cost materials and can be easily transported by air.

Problems of Salvaging

Still, problems of salvaging need further investigation--such as breakout, which is freeing objects from ocean bottom. To this must be added expected hazards of ocean; weather deterioration during a dive; currents providing unfavorable drift rates; unstable bottom sediments, and many more.

Treasure lost in 1553 when a Spanish fleet carrying gold and silver sank off Padre Island near Texas coast was the object of search by three Texas A & M divers.

The divers used magnetometer readings to indicate metallic or rock interruptions on Gulf bottom. These were investigated. When wreckage was found, shore crews took compass readings to record exact location. All artifacts were turned over to the state committee. The project's primary function was to mark the wreckage to prevent plundering and illegal recovery.

8 UNIVERSITIES BUY THEIR OCEAN LAB SITE ON L.I.'s EASTERN TIP

The New York Ocean Science Laboratory--an 8-school consortium--has bought a 36-acre tract in Montauk, on Long Island's eastern tip, for a waterfront campus and center. The lab had leased part of the property since June 1969.

The lab is operated by colleges and universities in the N.Y. metropolitan area. It is conducting 7 research projects on the marine environment.

The schools are: Adelphi University, Fordham University, Hofsta University, Long Island University, the New York Institute of Technology, New York University, St. John's University, and the State University of New York.

Step Up Program

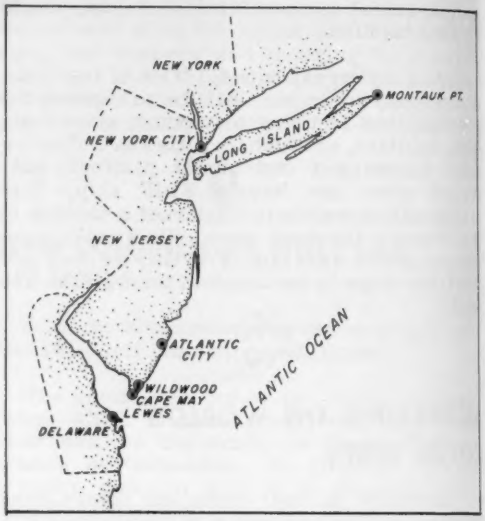
Dr. John C. Baiardi, the lab director, said the acquisition of property will "enable the laboratory to step up its renovation and expansion program."

"We can now intensify our program to recruit qualified professionals so we can better address ourselves to the problems of Long Island waters and to the preservation of our overall marine environment."

To Make Huge Model

One of the lab's major undertakings, to begin this year, is construction of a $4-million hydraulic model of Long Island and its waters.

The model will be built in stages. The first will be the Great South Bay. Each will be functional when completed. The model will be housed in a former hangar 600 by 200 feet.



Almost any condition of currents, tides, storms, erosion, and water pollution could be produced in the model, according to Dr. Baiardi. The model of the whole island is scheduled to be completed by 1975.

Finfish & Invertebrate Lab

Dr. Baiardi said that the lab's scientific and technical staff would quadruple in 1971 to about 50.

The first project will be to convert one of the 10 buildings to a finfish and invertebrate lab. Until now, the lab has worked with movable equipment on 30,000 square feet of office space.

With the other buildings, the lab will have 300,000 square feet of space available. There are 5 railroad sidings and a 400-foot dock with a 40-foot water depth at low tide. The lab moors there the 'R.V. Kyma', a chartered research vessel.

VIMS DEVELOPS COASTAL ENVIRONMENTAL & ENGINEERING DATA CENTER

Scientists at the Virginia Institute of Marine Science (VIMS), Gloucester Point, are developing a comprehensive data system to provide industry and government with the most up-to-date information on oceanography of Chesapeake Bay and Virginia coastal waters. This was announced by Dr. William J. Hargis Jr., director.

Dr. Hargis explained: "The data system, called Marine Environment and Resources Research and Management System (MERRMS), will be a depository whereby all available information about hydrography, chemistry, geology, and biology of the Chesapeake Bay area can be stored, retrieved and utilized by planners, engineers and management agencies." A unique feature will be the visual presentation of information to enable viewers to assess quickly "many relevant factors operating on a given environment."

MERRMS will provide management advice on "estuarine and coastal problems involving wetland use, shoreline and beach erosion, sedimentation, pollution, dredging, and fisheries to state and federal agencies having responsibilities in these areas."

Remote Sensing Unit

Integrated with MERRMS will be a Remote Sensing Unit to provide monitoring of the natural or original position ('in situ'). VIMS will continue to use traditional aerial surveillance and photography. It will use, too, newer techniques of aerial sensing developed by NASA and the Department of Defense. Satellite sensing also will be evaluated and used "where applicable."

Remote sensing from airplanes and satellites records much detail from over a large land or water surface at relatively low cost. The usefulness of the data recorded, however, depends on trained personnel to recognize specific areas or conditions recorded as photographs, or in other ways, as the areas or conditions they have seen close up. 'In situ' remote sensing often is necessary to evaluate aerial and satellite observations, provide "ground truth", and to understand in detail the condition of the environments and resources involved.

Data Needed

Hargis emphasized that all those responsible for cleaning up pollution and protecting coastal zones from degradation must have much information available. "Neither industrial engineers nor governmental management agencies can regulate resource use without a fund of scientific and engineering knowledge to draw on, and the pressures of the times demand that this knowledge be available to them in detail as well as in context of comprehensive overview."

Hargis believes MERRMS will become prototype for attacking problems of coastal environments and resources--in Chesapeake, mid-Atlantic, or along coasts:

"In the United States, concern is so strong for protecting resources of the ocean coast, bays and estuaries that a National Coastal Zone Program is developing at the federal level. The over 30 maritime states, Commonwealths and Territories are making strong efforts to improve management of and research on coastal resources.

"From Maine to Florida on the Atlantic, from Florida to Texas on the Gulf, from California to Washington and Alaska on the Pacific, and Hawaii in mid-Pacific--all these states are vigorously planning and conducting research looking to better utilization and conservation of coastal fisheries, wetlands, shorelines, bottoms and water. It is hoped that establishment of our data storage, retrieval and analysis system, MERRMS, will be Virginia's significant contribution to this effort."

Dr. Hargis believes the general public, fishermen, and those in seafood industries will benefit. "The Institute's own research programs will be improved."

NAVY SUCCEEDS IN GETTING OCEAN DATA VIA BUOY-SATELLITE HOOKUP

A free-floating, specially instrumented buoy, drifting off Virginia, recently dispatched data needed to understand surface current patterns to a solar-orbiting satellite. It was achieved on the first try by the U.S. Naval Oceanographic Office (NOO).

The satellite-acquired data were sent to scientists studying current patterns at NOO via NASA's Fairbanks, Alaska, command control station and the Goddard Space Flight Center in Greenbelt, Md. The data consisted of wind and temperature measurements, together with exact positions.

NOO's success has led its officials to think of launching two such buoys in Gulf Stream in 1972.

The Buoy

The 42-foot-long, 1,700-pound buoy is instrumented with wind and temperature sensors, data-recording electronics, and a sophisticated satellite communications system. It was set adrift in 50 minutes in relatively calm seas about 200 miles northeast of Cape Charles, Va., and 75 miles northwest of Gulf Stream by scientists aboard USNS 'Lynch', a small oceanographic research ship.

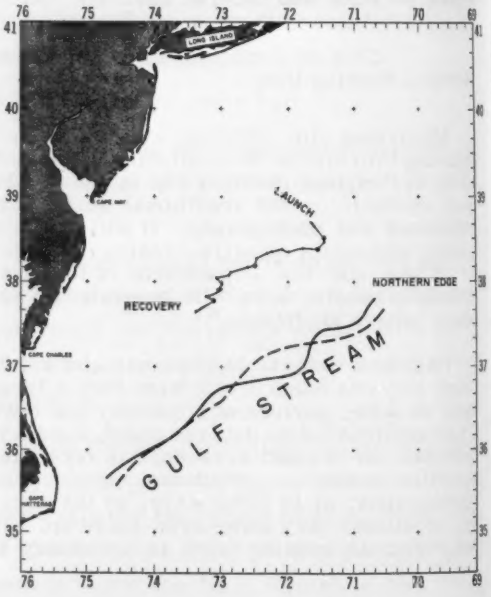
Coast Guardsmen aboard the USCG 'Evergreen' retrieved buoy 21 days later about 90 miles southwest of its launching site. This southwesterly drift "was more or less expected," according to Alton Crumpler, oceanographer. "All our historical data," he said, "pointed to this general flow, but the current carrying the buoy and its exact course were unknown. It may be part of a large gyre (a circular-moving current), which may, at some later point, merge with the northeastward-flowing Gulf Stream."

Study's Goal

The oceanographers are studying surface current patterns to understand ocean circulation worldwide. This could lead to mass water movement predictions that would facilitate ship routing for the Navy, U.S. Merchant Marine, and allied shipping interests.

Also, the predictions could help determine the movement of sea ice, icebergs, and oil spills--and help in rescue and salvage operations.

BUOY DRIFTS ON CURRENT--Scientist aboard USNS 'Lynch' watches specially instrumented buoy begin its drift off Virginia (above). Chart below shows how it moved in relation to coast and Gulf Stream. (U.S. Naval Oceanographic Office)



NAVY DEVELOPS DEEP-DIVING SYSTEM

The U.S. Navy has developed a deep-submergence system that will enable its divers to conduct rescue and salvage operations at 850 to 1,000 feet. The achievement comes after nearly 8 years of trouble-plagued efforts.

In the past, Navy divers were limited to about 300 feet for short periods by severe chilling and fatigue.

The new system, called Mark I, is markedly superior to the 'Man in the Sea' projects, the Navy says. The first Mark I will be based at Norfolk, Va.

The Mark I

Now, alternating 2-man teams of Navy divers can stay at 850 feet or below for up to 29 days. The new system opens Continental Shelf areas the world over to rescue and recovery operations.

The Mark I is designed to support 4 men: two 2-man teams each working 4-hour periods. This and decompression time after saturated dive total up to 29 days.

The heated divers' suits of Mark I and its undersea "landing capsule" use techniques borrowed from manned Apollo program.

Mark I operates from a mother ship that houses a 2-chamber decompression unit, mission control, communications, and the main life-support system.

Locked to top of large decompression chamber is a bulbous personnel transfer capsule, or elevator. It can handle 2 or 3 men. The capsule is detached from chamber--as lunar landing module is separated from Apollo command module--and lowered by winch and cable to desired depth.

The entire Mark I system can be transported anywhere aboard two C-141 cargo planes. It can be deployed quickly aboard any ship.

Decompression Chamber

The decompression chamber can accommodate 4 men. It contains food, water, beds, bath and toilet, and monitoring communications.

While one team works, the other--already conditioned to 850-foot depths--waits in chamber. When the first returns aboard transfer capsule, the second takes over.

Transfer Capsule

When transfer capsule with 2-3 divers reaches desired depth, divers don aquanaut suits. They leave through pressurized lock. This is a 100-foot umbilical cord linking them to capsule and providing life support and communications.

One diver, in his shirtsleeves, remains in capsule to monitor work and communicate with mother ship.

A constant check on divers' condition and progress is maintained by physicians and others on surface using space-type monitoring, including TV and telemetry.

DEAD MANGROVE LEAVES SUPPORT AQUATIC LIFE

Red mangroves--tropical trees that fringe South Florida's bays--have "immense value," reports the University of Miami's School of Marine and Atmospheric Sciences. ('South Florida's Mangrove-bordered Estuaries, Their Role in Sport and Commercial Fish Production'.) Much of the information in the 28-page bulletin is based on work of two graduates, Dr. Eric J. Heald and Dr. William E. Odum.

"Many persons consider estuaries and coastal marshes to be useless in their natural state," noted Dr. Richard G. Bader, Associate Dean. "They do not realize that these areas are important as havens and nurseries for over half of the harvest of fish and shellfish in the United States. In southern Florida, for example, the 700 square miles of mangroves bordering the shallows are inhabited by thirty or more popular species of commercial and sport fishes, the pink shrimp, and the blue crab."

Mangroves Linked to Valuable Catch

Dr. Bader added: "Decomposition of dead mangrove leaves that have fallen into the water results in a high-protein food for small marine animals, which are eaten by larger ones. In 1968, commercial landings of species linked to the mangrove food web yielded over 32 million pounds of shrimp worth $15.7 million; 3.7 million pounds of spotted seatrout worth $1 million; and 15 million pounds of blue crabs worth $1.2 million. Consideration should be given to the fact that nature's production of these resources is greatly decreased in an area where clearing, filling, or bulkheading destroys the mangroves."

Mangrove Study

Dr. Heald and Dr. Odum studied the red mangrove, Rhizophora mangle, and its role in food web of North River estuary of Everglades National Park. They found that only 5% of area's annual production of red mangrove leaves is consumed by land animals--while about 95% enters aquatic system.

Their work showed that decomposed mangrove leaf particles, detritus, transport energy in the food web. When dead leaves fall into water, they become hosts for certain bacteria and fungi. These microorganisms use the plant material as a place to live and to get nutrients; they have ability to absorb resistant plant substances, such as cellulose, and to decompose leaves.

Food Web

Also, one-celled animals (protozoans) feed on the bacteria. This creates a rich food complex of fungi, bacteria, protozoa, and detritus. Tiny crabs and amphipods ingest this complex, digest microorganisms off detritus particles, and release the indigestible plant cell walls into water as fecal material. Then, the detritus particles are recolonized by microorganisms and "repeat their role as carriers of nutrients."

Mangrove-leaf fall produces more than 3 tons (dry weight) of detritus per acre a year. When leaves are alive on trees, they contain about 6% protein, but this value increases up to 22% after detritus has been in the water a year. This does not mean, the researchers say, that the protein content of detritus itself has increased; it means that there is relatively more protein present on particle because it is being colonized by microorganisms rich in vitamins and protein. "A detritus-consumer will obtain more nutritive value, therefore, by eating 'aged' detritus particles because they are more heavily coated with microorganisms."

Detritus Important

Analyses of stomach contents of thousands of marine animals in North River estuary revealed they consume little phytoplankton and bottom-growing algae. Eighty to 90% of the diet of many crabs, worms, insect larvae, shrimp, and small forage fishes consists of mangrove detritus. Then these detritus consumers fall prey to more than 60 species of juvenile fishes, including tarpon, snook, gray snapper, sheepshead, red drum, spotted seatrout, crevalle jack, catfish, jewfish, menhaden, and striped mullet. Many of these fishes spend long periods in the estuary; others in surrounding coastal waters into which about 50% of yearly tonnage of detritus is transported. Here, as in estuary, it is eaten by lower animals in food web.

Pollutants in Estuaries

So many species depend on mangrove detritus as a source of nutrition that scientists are concerned about possible pollutants in estuaries. Pesticide residues can become adsorbed onto surface of detritus, or may be concentrated by bacteria, fungi, and protozoans living on particles. If crude oil is introduced into the water, it may form around particles and prevent microorganisms from colonizing them. Certain chemical pollutants could kill the microorganisms. Thermal pollution could produce undesirably low levels of dissolved oxygen in areas where water exchange is poor.

Sea Grant Program

The Sea Grant Program enables the University of Miami to disseminate scientific data to the public and to government officials responsible for decisions on environmental changes. Increasing population in south Florida makes certain changes inevitable. But if people become more concerned about the principles involved, the researchers hope, perhaps the modifications can be reduced.

Sea Grant information Bulletin #4, at $1, may be obtained from: Sea Grant Advisory Services, 10 Rickenbacker Causeway, Miami, Florida 33149.

NOAA AWARDS SEA GRANT TO STUDY SPONGES' ANTIBIOTIC SUBSTANCES

NOAA has awarded a Sea Grant to extract and test antibacterial agents from sponges. The $209,000, 3-year grant was awarded to New York Zoological Society's Osborn Laboratories of Marine Sciences.

Osborn scientists will attempt to isolate substances found in sponges that may have therapeutic value as antibiotics, antifungal agents, and metabolic inhibitors. Then the researchers will seek to determine chemical composition of these substances and to investigate their potential as therapeutic agents.

Scientific Studies Are Recent

Known and used by man for centuries, it is only recently that the sponges' biochemistry has been investigated. Mostly fresh-water forms easily maintained under laboratory conditions were studied.

The Osborn Laboratories of Marine Sciences are equipped with piped-in sea water. Its scientists have investigated systematically the extracts of many sponges from Jamaica and British Virgin Islands. Antibacterial substances were present in extracts from 23 of the 125 Jamaican species--and seem to indicate they are commonly found.

A Tunisian sponge trimmer.

In the Northeastern Gulf of Mexico

HARVESTING COASTAL PELAGIC FISHES WITH ARTIFICIAL LIGHT & PURSE SEINE

Donald A. Wickham

Coastal pelagic fishes in the Gulf of Mexico represent a latent resource estimated at 4 million tons, a potential 8 times the present 500,000 tons (Bullis & Carpenter, 1968). These could be harvested economically with purse seines if supplemental methods, such as light attraction, were developed to create commercial aggregations in areas with fishable bottom. Experimental night-light purse seining revealed that fish could be attracted throughout the night, but that average catches were larger during the new moon.

Three species contributed 50% or more of total catch weight in 71% of experimental sets. Their potential was estimated the greatest among latent coastal pelagics. These were Spanish sardine, Sardinella anchovia; Atlantic thread herring, Opisthonema oglinum; and scaled sardine, Harengula pensacolae.

Nightly total catches from a light source, a single 1,000-watt underwater mercury vapor lamp, ranged from 500 pounds to over 6,000 pounds. The nightly average was 2,500 pounds. It indicates that artificial light can be developed for harvesting coastal pelagics.

Present production of coastal pelagics is based primarily on purse seining for menhaden, Brevoortia spp., for reduction to industrial products. There are indications the catch of B. patronus has reached or perhaps surpassed level of sustainable yield. At best, this species is only the third, and perhaps only fifth, most abundant coastal clupeid in Gulf. Stocks of thread herring, Opisthonema oglinum, alone have been estimated at about one million tons (Bullis and Thompson, 1967).

Butler reported in 1961 that the behavior of the herringlike coastal pelagics makes them difficult to capture with standard purse seines. At times, large schools divide rapidly into smaller groups that are extremely fast and difficult to encircle with a purse seine. Fuss and his colleagues reported in 1969 that the thread-herring fishery has been confined to a small area off Ft. Myers, Florida, in less than 10 fathoms. This is because of rough bottom conditions to north and south, and depth limitations of tom-weight purse seines prevents successful fishing. The feasibility of harvesting this resource economically with present methods has yet to be demonstrated.

Facilitating Economical Exploitation

Economical exploitation of coastal pelagic resource could be facilitated in two ways: by development of new fishing gear, or by introducing to purse-seine fishery supplemental methods capable of forming commercial-sized aggregations in areas with fishable bottom. In 1960, von Brandt reviewed methods

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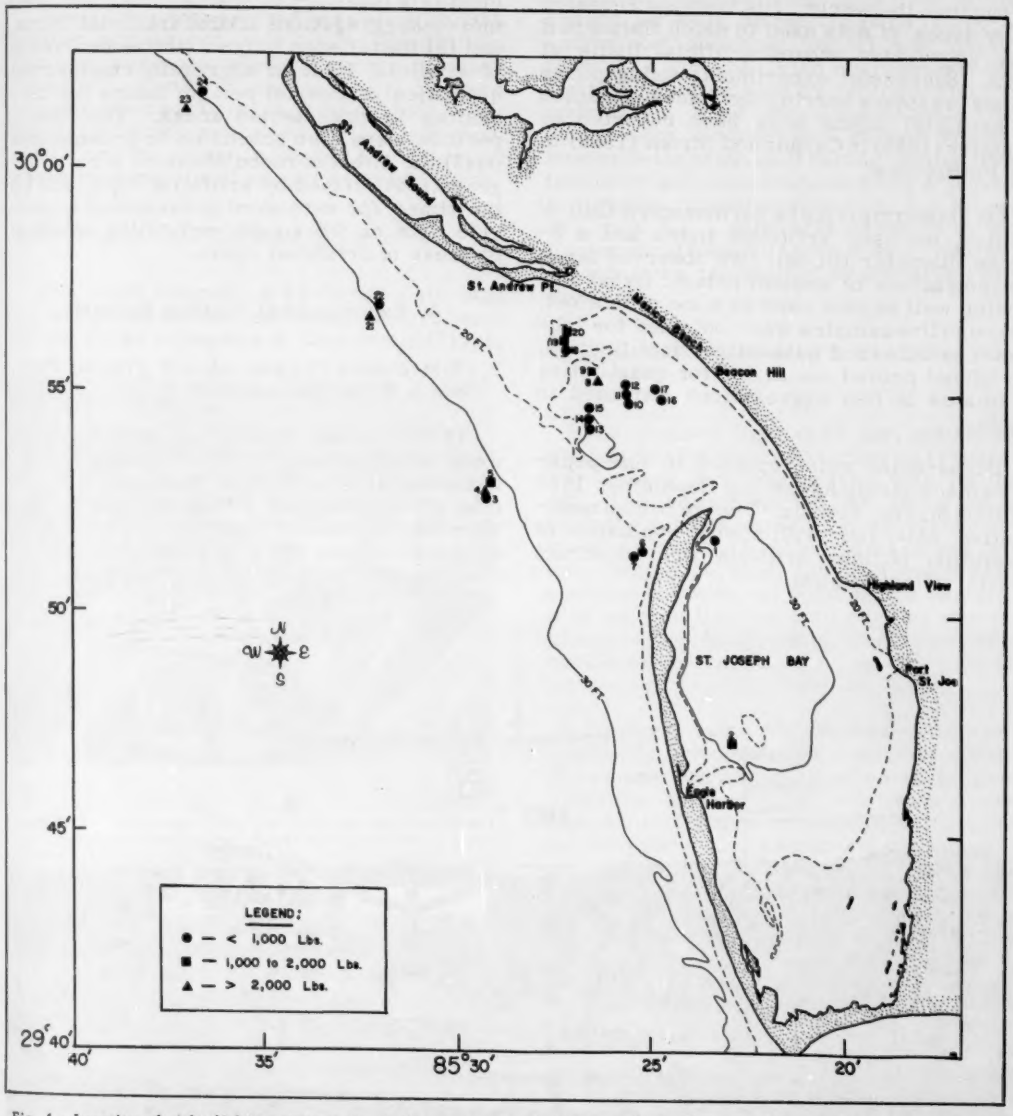

Fig. 1 - Location of night-lighting stations sampled by purse seine during Aug.-Sept. 1969. Sample numbers are beside each station. Legend is key to catch size.

of harvesting sardines and related species throughout the world. His findings revealed many types of nets used to catch fishes that have aggregated around artificial lights at night. Successful experiments using purse seines to capture herringlike fishes attracted to artificial lights have been reported by Gauthier (1969) in Canada and Ström (1969) in the Philippines.

On collecting trips in northeastern Gulf of Mexico, we used artificial lights and a 5-meter diameter lift net. We observed large concentrations of coastal pelagic fishes extending well beyond capture zone of this net. Although live samples were obtained for laboratory studies and qualitative identification, the lift net proved unsuitable for quantitative estimates of fish aggregations attracted to lights.

Purse-seine sets reported in this paper were made during August and September 1969 off Port St. Joe, Florida. They provided quantitative data for preliminary evaluation of feasibility of using artificial light to attract coastal pelagic fishes.

This preliminary study provided: (1) beginning of inventory of species that form commercial aggregations around artificial lights, and (2) initial step in quantitative evaluation of artificial light to aggregate commercial quantities of coastal pelagic fishes for harvesting in preselected areas. The fishing periods were also scheduled to provide data on (3) the effect of moon phase on size of aggregations formed by artificial light, and (4) the times for sets were preselected to provide data on intranight variability of effectiveness of artificial lights.

A. Experimental Fishing Methods

1. Objectives & Organization of Fishing Periods & Experimental Sets

Three periods during new and full moon were scheduled to provide preliminary indications of effects of lunar phase on aggregation effectiveness of artificial lights. Sets were made at about 3-hour intervals following sunset to assess intranight variability of attracting-characteristics of artificial lights.

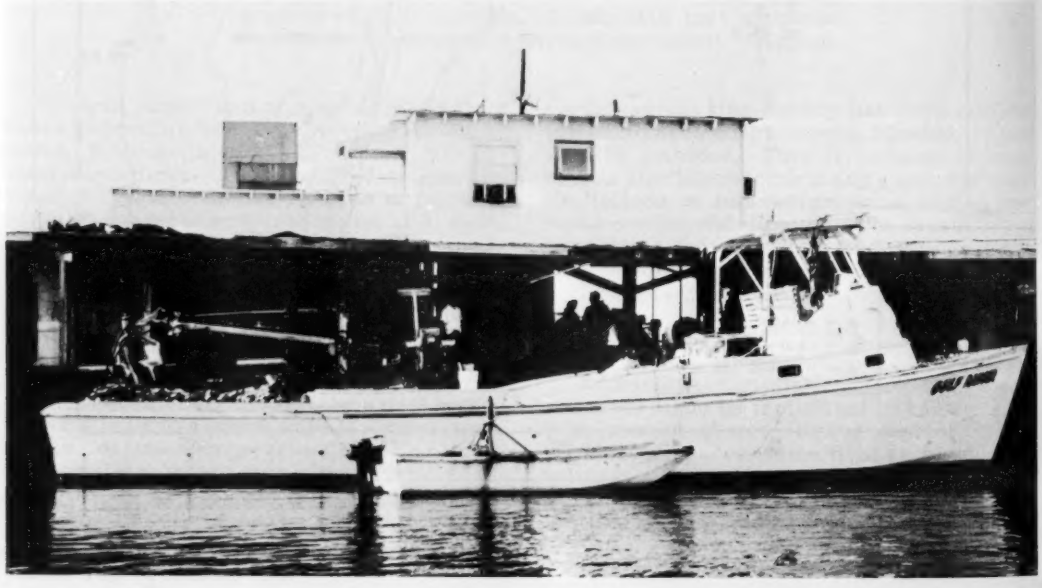

Fig. 2 - The chartered 49-foot, single-boat rig, bait purse seiner, 'Gulf Ranger'. The net skiff is tied alongside seiner.

2. Selection of Fishing Stations

The fishing area selected was along 30-foot contour across entrance to St. Joseph Bay. Stations were occupied whenever weather permitted. Considerable inclement weather was experienced during charter periods. Because light skiff was an open 16-foot outboard, most locations shown in Figure 1 were determined by wind direction and sea conditions.

3. Fishing & Experimental Equipment

The 'Gulf Ranger', a 49-foot, single-boat rig, bait purse seiner, was chartered (Figure 2). Its purse seine was a "tom-weight" type, 1,545 feet long and 71 feet deep, with $1\frac{1}{4}$-inch stretched mesh webbing. A 16-foot outboard served as skiff; attracting lamp (1,000-watt underwater mercury vapor) was deployed from it (Figure 3). Fish aggregations below light were monitored by echo sounder. The underwater lamp and echo-sounder transducer were mounted on a wooden depressor suspended beneath skiff during fishing. Power for lamp and echo sounder were supplied by a portable, gasoline-powered, 2.5 kilowatt, 115 volt A.C., generator mounted in skiff. Communications between skiff and purse seiner were maintained by portable FM radios.

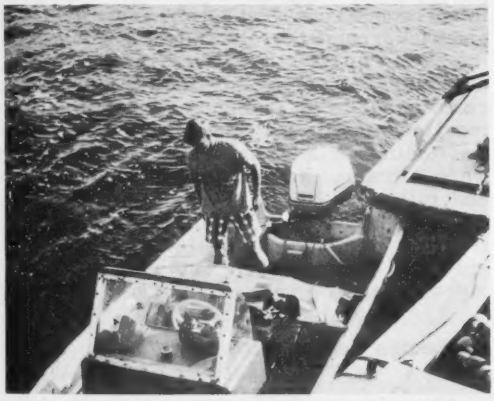

Fig. 3 - The 16-foot outboard used as a light skiff during study. The portable echo sounder is mounted across boat behind bench seat. The underwater light and echo-sounder transducer are mounted on wooden depressor lying in right hand corner of stern. The portable generator, not shown, was positioned in bow ahead of steering console.

4. Experimental Fishing & Sampling Procedure

The manned light skiff was anchored on station at night with light turned on (Figure 4). The seiner anchored nearby with its lights off. The seiner turned its lights on only after the net was pursed. When seiner began making a set, the light skiff anchor was pulled up. During pursing, the skiff would drift to corkline opposite net opening and remain inside net with light on until pursing was completed. The skiff would then move across corkline and resume fishing with light after anchoring clear of seiner and net.

The total catch weight was estimated by vessel captain after net bunt was dried up. A sample was brailed into a large plastic container to be weighed, sorted, and identified while fishermen handled catch and restacked the net. This general procedure was followed during each set.

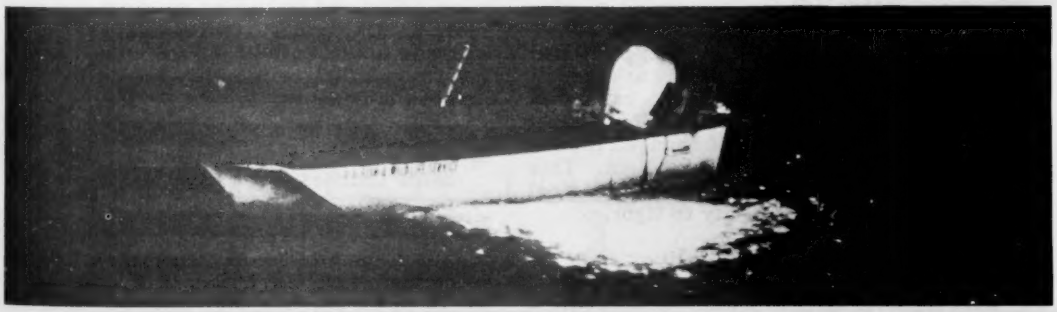

Fig. 4 - The light skiff anchored on station with 1,000-watt mercury-vapor underwater attracting-light turned on. A large school of fish has accumulated around light, considerably reducing size of light field.

B. Catch Results

1. Attraction of Fish by Artificial Light

The operation of passive fishing gear (traps, bait, and artificial light) requires that fish pass within its effective zone of attraction before they can be subject to capture. So the catch of a passive gear depends on size of its zone of attraction and fish density therein. The characteristics of capture zone is not consistent because variables--turbidity, ambient light, biological rhythms, and many others--influence effectiveness of gear and/or susceptibility of animal to capture; this variability is reflected in catches.

Catches from individual sets around the light showed considerable intranight and internight variability.

a. Intranight variability

Catch data averaged by set time for new and full moon periods, disregarding location and other variables, indicates that artificial light was effective in attracting fish throughout the night (Figure 5). There was consistency in average catches for the three nightly sets, during both new and full-moon periods (Figure 5). This suggests that intranight catch variability for individual sets probably resulted from different fish densities in envelope of water within which light was effective. This conjecture was supported by visual observations and echo-sounder tapes made from the light skiff. These indicated that schooling species, the bulk of larger catches, usually arrived in the light field in large numbers at infrequent intervals; the remaining species appeared to accumulate gradually. These results contrasted with lift-net sampling that indicated early evening and predawn peaks for light-attraction effectiveness. In view of purse-seine catch, peak periods for lift-net catches may be indicative of changes in dispersion distance around artificial light. This arises, possibly, from rhythmic physiological changes in fishes' sensitivity to light.

b. Internight variability

Internight variability in total catch resulted primarily from environmental factors--location, water turbidity, thunderstorms, and others--which could affect catch and light's attraction characteristics. Some effects of location on catch are shown in Figure 1. However, the present data are not sufficient to permit analysis of effects of environmental factors on light-attracted catches.

c. Lunar pattern

The effects of moon phase on attraction by artificial light are noticeable in comparison of average catches per set by moon phase. Figure 5 shows average catch per set was considerably larger during new moon than during full moon. Present data only permit speculation on causes of different catch rates for these two lunar periods. However, it is probably that bright ambient light during full moon reduces contrast between artificial light and background, thereby reducing appreciably the extent of effective attraction zone. Also, physiological changes related to lunar cycle could render fish less susceptible to attractraction by artificial light. In terms of potential fishing applications of artificial light, fish were attracted successfully during both new and full moon. The full importance of moon phase to commercial application of light attraction requires accumulation of considerably more comparative catch data than provided here.

2. Species Composition

Over 50 species of fishes were identified in catches from purse-seine sets made around artificial light. Menhaden are not commonly fished in the study area; none was caught. Spanish sardine, Atlantic thread herring, and scaled sardine, usually bulk of larger catches, were estimated as having greatest commercial potential among latent coastal pelagic resources in the Gulf. Their combined contribution was 50% or more by weight in 71% of catches (Figure 6).

3. Comparison With Conventional Purse-Seine Catches

Nightly catch totals are not all based on full night's fishing of 3 sets. Nevertheless, they still average slightly better than 2,500 pounds per night for entire study. Catches made during new moon periods alone averaged better than 3,000 pounds per night, although only 2 of the 7 nights fished consisted of a full 3 sets.

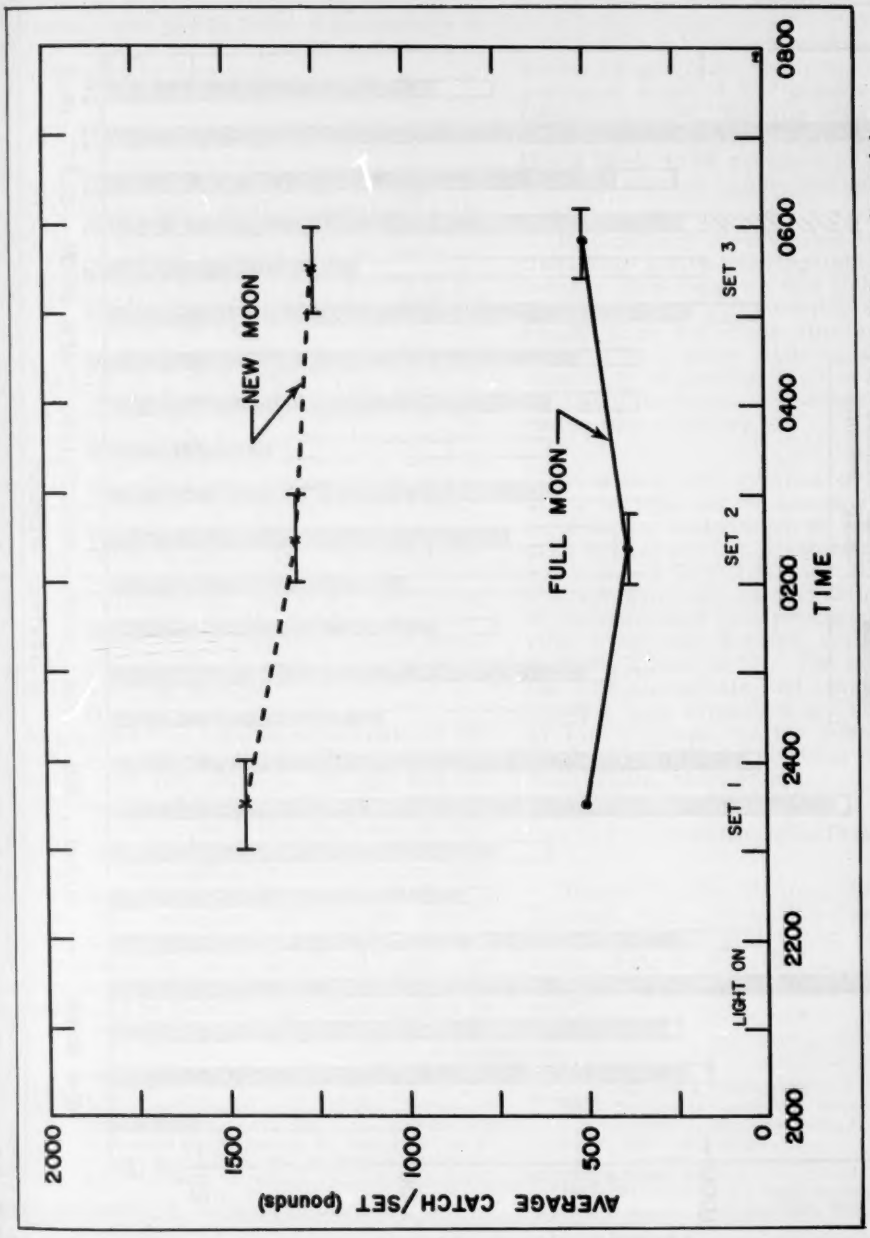

Fig. 5 - Catch data averaged by set time for new and full moon charter periods. Locations and other variables were disregarded.

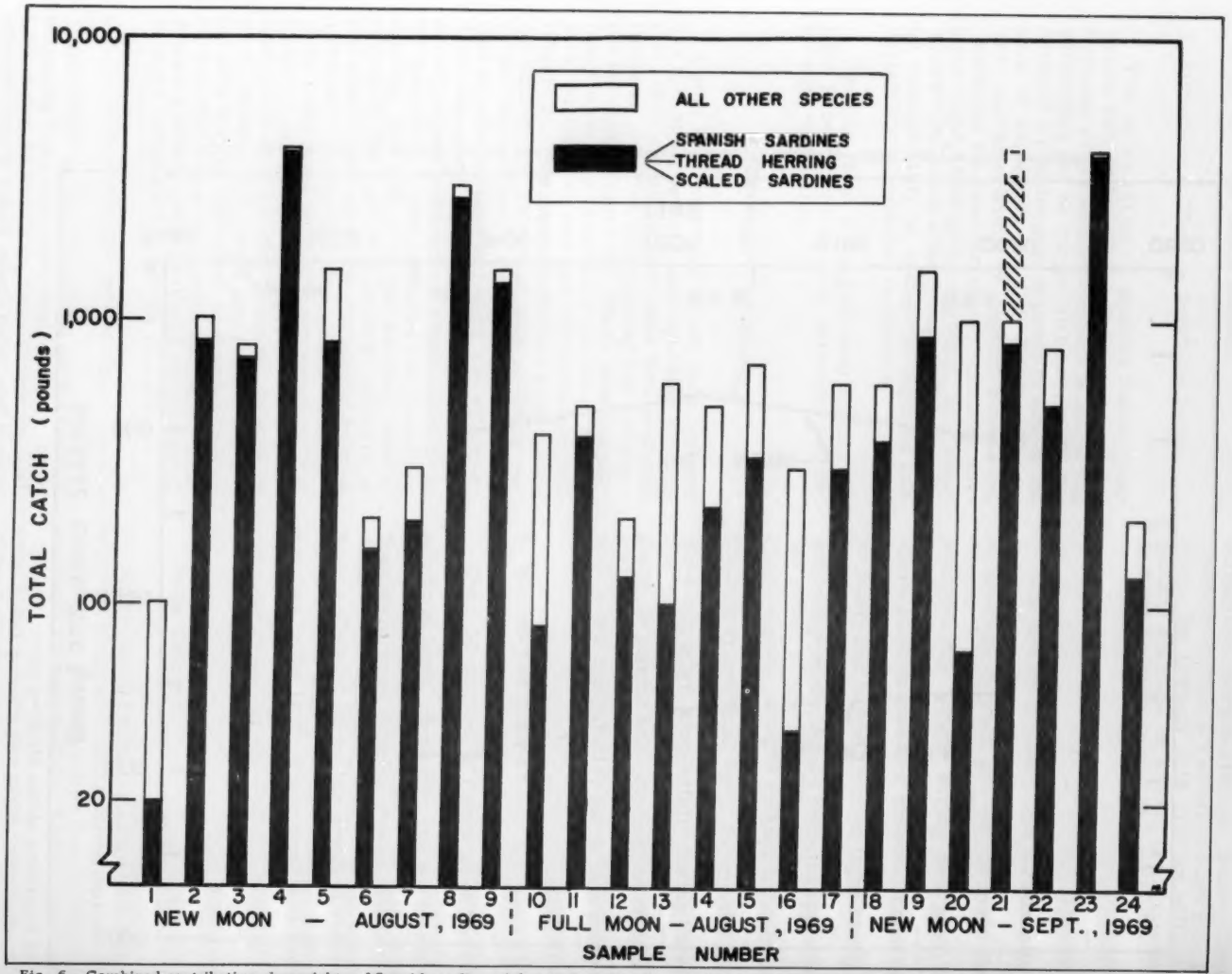
10,000
1,000
100
20
TOTAL CATCH (pounds)
ALL OTHER SPECIES
SPANISH SARDINES
THREAD HERRING
SCALED SARDINES
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
NEW MOON — AUGUST, 1969
FULL MOON — AUGUST, 1969
NEW MOON — SEPT., 1969
SAMPLE NUMBER

Fig. 6 - Combined contribution, by weight, of Spanish sardine, Atlantic thread herring, and scaled sardine to total catch for each nightlighting purse-seine sample. Sample 21 has been extended to account for estimated 3,000 to 4,000 pounds lost because of gear trouble.

Compared with conventional daytime purse-seine fishing in general study area, our nightly total catch average was lower than average of 4,000 pounds per set reported by captain of our chartered bait seiner.

C. Summary and Conclusions

This study indicates that artificial light can be used to aggregate coastal pelagic fishes, the greatest latent commercial potential in Gulf of Mexico. These species can be attracted throughout night, although moon phase, probably because of ambient light levels, appears to affect size of aggregations.

The pattern of fish aggregation indicates that effectiveness of artificial light depends on fish density, as would be expected for any passive attracting gear. For maximum effectiveness, light attraction should be used in high-fish-density areas. Lights in high-density areas would need to be set on more frequently during night than lights in low-density areas. The formation of large fish concentrations early in evening would block light and reduce its continued efficiency, therefore restricting its potential total night's production. Conversely, lights in low-density areas would need to be set on only once each night just prior to morning twilight.

We showed that a purse seine could be set around an artificial light. Our experience indicates that fish attracted to light are not greatly disturbed by encircling net. Therefore, purse-seine sets can be made slowly around a light allowing for maximum gear deployment. These sets also would require less skill than for successful conventional sets because fish remained undisturbed within light field. So unsuccessful sets could almost be eliminated by using artificial light. An additional advantage would be financial savings realized by locating light-fishing sites in known areas. This would reduce search time, a high cost in purse seining.

Nightly total catches from our single light source ranged from 500 to 6,300 pounds, and averaged about 2,500 pounds throughout 3 fishing periods. Despite advantages, use of light as accessory technique to purse seining is not likely to be accepted by fishing industry until catches can be increased.

Preliminary observations indicate that fish follow a slow-moving light for short distances. This suggests that fish aggregations from several lights possibly could be led to single area for more efficient harvesting. Considerably more study is required before feasibility of leading fish can be determined and useful techniques developed for incorporation into a fishery.

This study strengthened our contention that artificial light can be developed as a supplement to conventional purse seining for more efficient harvesting of latent coastal pelagic resource of Gulf of Mexico. It provides encouraging indications that artificial light can be incorporated into proposed National Marine Fisheries Service netless harvesting system (Klima, 1970). The studies required for both immediate and long-term applications of light attraction are now in progress at the National Marine Fisheries Service, Exploratory Fishing and Gear Research Base, Pascagoula, Mississippi.

Fig. 6 - Combined contribution, by weight, of Spanish sardine, Atlantic thread herring, and scaled sardine to total catch for each nightlighting purse-seine sample. Sample 21 has been extended to account for estimated 3,000 to 4,000 pounds lost because of gear trouble.

ACKNOWLEDGMENT

Bennie A. Rohr, National Marine Fisheries Service, Pascagoula, Mississippi, provided species identifications and assisted in field work. John R. Watson Jr., cooperative student, University of West Florida, manned light skiff.

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Evidence indicates that —

A PREMIX OF FPC & WHEAT FLOUR CAN BE MADE & TRANSPORTED

Virginia D. Sidwell, Bruce R. Stillings,
& George M. Knobl Jr.

The authors conducted a study to determine if mixtures of wheat flour and fish protein concentrate (FPC) would tend to separate during the agitation of a mechanical shaker. Mixtures of 90% wheat flour and 10% FPC were placed on a shaker for 168 hours. Despite differences in particle size between the wheat flour and the FPCs, there was no evidence of separation.

FPC is intended to be used as a protein ingredient in foods. It has been used successfully in a variety of baked products (Sidwell, et al., 1970). When used in products based on wheat flour, FPC either could be added directly to the other ingredients--or an FPC-wheat flour premix could be prepared and used later in the products. The premix would be advantageous because it could be prepared easily in bulk at large industrial centers. It could then be shipped and distributed to food-processing plants in this country or in foreign countries.

Wheat flour and FPC particles, however, may differ in size and other characteristics. Because of these differences, separation might occur during shipment and result in a non-uniform premix. The purpose of our experiment, therefore, was to determine if mixtures of wheat flour and FPC separated when subjected to continuous agitation.

MATERIALS AND METHODS

The wheat flour used was a patent, bromated, enriched bread flour obtained from the Pillsbury Company, Minneapolis, Minnesota.

The FPC was prepared by isopropyl alcohol extraction of red hake (Urophycis chuss) (Bureau of Commercial Fisheries, 1966). Two FPC samples were used that had been ground in different mills to produce material with different particle sizes. One sample was milled in a Rietz disintegrator1/ and was relatively coarse; the second sample was milled in a fluid energy mill and was relatively fine.

The wheat flour and the two FPC samples were analyzed for crude protein by the method described in Section 2.044 of the AOAC Methods of Analysis (1965). The moisture content was analyzed by drying the samples in a forced-air oven for 16 hours at 100° C. Ash was determined by burning the samples in a muffle furnace for 16 hours at 550° C.

The particle size distribution of the samples was determined with a Ro-Top Testing Sieve Shaker. This consisted of a series of four U.S. Bureau of Standard Sieves, which had the following pore sizes: 149, 105, 44, and 37 microns. One hundred-g samples were placed on the top sieve and the shaker was run continuously for 30 minutes. The material remaining on each sieve was then weighed separately.

Dr. Sidwell is Supervisory Food Technologist, Dr. Stillings, Supervisory Research Chemist, & Dr. Knobl, Research Director, National Center for Fish Protein Concentrate, National Marine Fisheries Service, College Park, Maryland 20740.

1/Trade names are used merely to facilitate descriptions; no endorsement is implied.

COMMERCIAL FISHERIES REVIEW
Reprint No. 901

The bulk density of the wheat flour and FPC samples was determined also. Each sample was carefully poured into a 25-ml graduated cylinder with a n opening of 1 cm. The sample was removed and weighed. The bulk density was calculated by dividing the 25-ml volumes into the weight of the sample.

Two wheat flour-FPC mixtures were prepared: one contained the coarsely ground FPC, the other the finely ground FPC. Each mixture weighed 2 kg, and each contained 90% wheat flour and 10% FPC. Two wide-mouth, 1-gallon glass bottles were lined with polyethylene bags. The wheat flour-FPC mixtures were transferred loosely to the bags, which were then tied. There was a small head space at the top of the containers. The tops were placed on the glass jars and they were placed on an Eberbach mechanical shaker operating at 60 oscillations per minute. The samples were allowed to shake back and forth continuously for 168 hours.

At the end of this period the mixtures had settled and there was approximately a 2-inch head space in the jars. The jars were scored with a glass cutter and carefully cracked open, so as not to disturb their contents. The polyethylene bags were cut lengthwise. Two random samples were taken from each of the top, middle, and bottom portions of the mixtures. To determine if separation had occurred during shaking, these samples were analyzed for protein, moisture, and ash by the methods previously described.

RESULTS AND DISCUSSION

Table 1 shows the particle size distribution in the two samples of FPC and the sample of wheat flour. The Rietz-milled FPC and the wheat flour were somewhat similar in particle size distribution. The fluid energy-milled FPC, however, was considerably finer than the other two samples. This FPC was not gritty in texture, whereas the Rietz-milled FPC had a definite gritty texture.

Table 2 shows the protein and ash contents and the bulk densities of the wheat flour and FPC samples. It is evident that there was a considerable differential between the wheat flour and the FPCs in their contents of protein and ash. Also, the bulk density of the wheat flour was slightly higher than that of the FPCs.

Table 1 - Particle size distribution of wheat flour and FPC (fish protein concentrate) samples[a]

Sieve opening	Sieve No.[b]	Percent by weight of samples held by each screen: Wheat flour	FPC: Rietz-milled	FPC: Fluid-energy milled
μ		%	%	%
149	100	0.0	0.5	0.0
105	140	12.3	14.3	0.5
44	325	68.3	44.8	0.6
37	400	16.8	9.0	30.2
<37	-	2.8	30.6	68.2

[a] Values are expressed as percent of the sample retained on indicated screen. Values for <37 μ are percentages of samples that passed through screen with openings 37 μ in size.
[b] Indicates approximate number of openings per lineal inch for U. S. Bureau of Standards Standard Screen Series.

Table 2 - Protein and ash contents and bulk densities of wheat flour and of FPC (fish protein concentrate) samples[a]

Samples analyzed	Composition of samples: Crude protein[b]	Ash	Bulk density
	%	%	
Wheat flour	11.8	0.47	0.535
FPC:			
Rietz-milled	87.7	13.1	0.488
Fluid energy-milled	87.6	11.5	0.450

[a] Values are expressed on a moisture-free basis.
[b] Nitrogen x 6.25.

Table 3 shows the protein and ash composition of the mixtures of wheat flour and FPC before and after shaking. After 168 hours of continuous shaking, the protein and ash contents of the mixtures at the three locations were nearly identical. These values were also nearly identical to those for the whole mixtures before shaking. These results show that no significant separation occurred in the mixtures during shaking.

The results from this study indicate that mixtures of wheat flour and FPC do not tend to separate during agitation. Although confirmation of these results under practical conditions is needed, they indicate that a premix of wheat flour and FPC could be prepared and transported without separation occurring.

Table 3 - Protein and ash contents of wheat flour and FPC (fish protein concentrate) mixtures before and after shaking for 168 hours[a]

Time and location of sampling	Composition of mixtures: Wheat flour 10% Rietz-milled FPC		Wheat flour 10% fluid energy-milled FPC	
	Crude protein[b]	Ash	Crude protein[b]	Ash
	%	%	%	%
Before shaking:				
Whole mixture	20.0	1.84	20.1	1.58
After shaking:				
Top of mixture	20.3	1.79	20.5	1.57
Middle of mixture	20.0	1.79	20.4	1.57
Bottom of mixture	20.1	1.77	20.4	1.57

[a] Values are expressed on a moisture-free basis. Each value is an average of duplicate analyses on each of two samples taken from each location.

[b] Nitrogen x 6.25.

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SOVIET SCIENTIST ASSESSES FUTURE OF WORLD FISHERIES

The Deputy Director of the Soviet Federal Fisheries and Oceanography Research Institute, Prof. Peter Moiseev, painted this picture of the future of world fisheries in 'Vodnyi Transport' in mid-1970:

The Ocean's Productivity: Bioproductivity is adequate in only 33% of the total ocean area--mostly in waters of the Continental Shelf and Slope, where over 70% of the oceans' phytoplankton is concentrated. Enough zooplankton is produced to support 300 million metric tons of fish and large invertebrates (squid, crab, and shrimp).

Commercially Exploitable Marine Grounds: Since most organic productivity occurs in water layers penetrated by sunlight, only depths to 600-800 meters can be fished commercially. The Continental Shelf and Slope yield 95% of world catch. Only 11% of ocean is less than 1,000 meters deep. The biological equilibrium between marine genera, families, and species can be disrupted by large-scale commercial fisheries that reduce abundance of stocks.

Maximum Sustainable Yield (MSY): Of ocean's productivity potential of 300 million tons, only 90-100 million tons can be harvested--provided commercial fisheries are regulated, which is imperative. In one hour of trawling, a large stern trawler takes an annual "crop" of 10 square kilometers of the Shelf; one purse-seine haul takes the "crop" of 100-500 square kilometers.

Intensive combined fishing by several nations in relatively small areas has depleted resources. Moiseev cited halibut off U.S. Pacific coast, flounder off Australia and in European waters, Pacific and Atlantic salmon, and Atlantic Ocean perch.

Expanded World Catch: If commercial fisheries are regulated effectively, total catch can be substantially increased--by expanding saury, horse mackerel, mackerel, anchovy, and squid fisheries. The largest concentrations of these occur 100-500 and more kilometers from shore.

Harvesting New Species: Moiseev recommended maxiumum commercial exploitation of small crustaceans that feed directly on plankton, especially Antarctic krill. He estimated resource at "many hundred millions of tons," and its MSY greater than today's world fisheries catch.

Fisheries Management and Fish Farming: To increase catches, expanded management, improved fishing techniques and gear, and organized large-scale fish farms are required. Moiseev suggested introduction of marine farms to breed fish, invertebrates, and algae useful to man.

He proposed that countries with major marine and distant-water fisheries combine to "organize a scientifically supported commercial fishery." He also favored an internationally agreed-upon period to study the oceans' biological resources, and the conditions, methods, and techniques for rational utilization and multiplication of marine fauna.

STOP MARINE POLLUTION AT SOURCES, FAO CONFERENCE RECOMMENDS

The only effective way to control pollution of the environment is to strike at the sources, agreed scientists at an FAO conference in Rome in Dec. 1970. The 415 environmentalists recommended ways to maintain the world "in a state in which man can thrive and evolve."

The conference recognized "the urgent need for a coordinated approach to marine pollution control" because this pollution was caused by agents from the atmosphere and the land, through river discharges, and by dumping and other direct contamination of oceans.

Local Action

Pollution can be countered at the source in most cases by "applying restraint, by local action under national jurisdiction, so as to restrict releases to levels and methods accepted as potentially harmless."

The possibility of recycling wastes in some instances was seen as a solution. The conference recommended that "research on waste-recycling techniques in industry should be encouraged as widely as possible."

Global Monitoring Needed

A global system for marine pollution monitoring received major attention. The first objective, the conference agreed, must be to provide data and information on the state and trends of ocean pollution. The purpose is to facilitate management measures and their enforcement.

As a first step, existing national monitoring programs, particularly in areas with a risk of heavy pollution, should be encouraged to cooperate in pilot regional monitoring exercises. These should be similar to those now being organized by International Council for the Exploration of the Sea (ICES) for North and Baltic Seas.

A conference resolution stated: "Such regional projects will provide the world with experience both in necessary techniques and in management of monitoring. They will at the same time facilitate contacts between the relevant laboratories regarding the essential basic research, the substances to be monitored, the sampling procedures and the analyses of pollutants."

Exploratory Survey Urged

To facilitate establishment of a global monitoring program, the conference urged a prompt preliminary exploratory survey by international cooperation to evaluate ocean pollution.

The survey's aim would be to "establish the levels of various substances--natural and artificially introduced--in the water column, together with their accumulation in the plankton, the benthos (plants and animals at the bottom of the sea), the fish and the sediments." The coastal zone should receive special attention.

The survey should relate to existing and proposed systems for monitoring terrestrial environment and the atmosphere.

"Cooperation among the international agencies responsible for monitoring all three of these components of the biosphere is essential," the conference said. "Their monitoring systems must be developed in close coordination so as to provide the maximum information and understanding through collaboration."

Off-Shore Dumping

Deliberate off-shore dumping in the high seas poses problems: It pollutes. It may produce physical (handling) problems and even dangers to fishermen. It may create international problems if done "extra-territorially."

The conference urged that "deliberate dumping of toxic wastes on recognized fishing and other shallow grounds be prohibited." It noted the accumulation of mercury by aquatic organisms "and the tragic consequences of mercury pollution to human health, particularly as exemplified by the so-called 'Minimate disease' in Japan. Moreover, because of the hazards of mercury poisoning and the banning of contaminated fish, the fishing industry in many parts of the world has suffered severe economic losses."

The conference said technology now is available to virtually eliminate losses caused by mercury. It recommended that governments act to "require advanced techniques for mercury recovery in all factories producing mercurial products or using mercury or its compounds as catalysts, cathodes or for other purposes in production." It also recommended that "seed-dressings, slimicides and other mercurial compounds be replaced at the earliest possible time by other non-mercurial subsitutes."

HALT DESTRUCTION OF CORAL REEFS, SCIENTISTS URGE

Scientists at the FAO Marine Pollution Conference in Rome, Dec. 1970, urged action to halt destruction by pollution of coral reefs. Reefs were described as "the most biologically productive of all natural communities, marine or terrestrial, for which measurements are available."

Dr. R. E. Johannes, Department of Zoology, University of Georgia, declared: "Undoubtedly only a small fraction of the damage man has done to coral reefs has been recognized and an even smaller fraction has been brought to the attention of those who could do something about it."

To anticipate man's impact on coral reefs, Dr. Johannes said, much more study of the environmental tolerances of the organisms comprising coral reef communities is needed. Investigations of corals have shown that these animals are very important. When they are killed, other reef fauna soon migrate or die. This dooms the reef.

Urges Surveys

He urged surveys of reef resources, particularly near populated areas, "just as we do with terrestrial communities." He said economists, biologists, and geologists should be involved in the surveys--because "the courtrooms of societies that respect money cannot be counted on to be responsive to aesthetic arguments in pollution cases."

Dr. Johannes noted the State of Hawaii survey of pollution effects on coral reefs in Kaneohe Bay. The survey included detailed evaluation of the monetary value. It "thus provides at least a partial measurement of the threat posed by pollution in terms the voter, the politician and the businessman understand."

Extent of Coral Reefs

Lagoons formed by coral reefs are scattered over 190,000,000 square kilometers. They supply high-quality protein food-fish to people living near the sea in the tropics, where terrestrial sources of protein often are inadequate. Also, the reefs are buffers against the ocean. They permit continued existence of about 400 atolls and many other low tropical islands. They preserve thousands of miles of continental coastlines.

"The uniquely peaceful and beautiful vistas that reefs present to the human visitor is a psychological resource to which any coral reef diver will bear witness," Dr. Johannes said. He cited many examples of destruction, or threats of destruction, to coral reefs. These ranged from Great Barrier Reef off Australia to those off Virgin Islands, Jamaica, and Bermuda.

WORLD FISHERIES CATCH DROPPED IN 1969

For the first time since 1948, the world's fisheries catch declined in 1969, The FAO Yearbook of Fishery Statistics for 1969 (published recently) gives 1969 world catch as 63.1 million metric tons; it was 64.3 million tons in 1968.

The strongest decline was in marine-fish catch: from 50 million tons in 1968 to 48.6 million in 1969. Actual landings, however, declined less: from 47.9 million tons to 47.2 million. The main reason appears to be lower production in some major industrial fisheries caused by a decrease of about 1.6 million tons in anchoveta catch, and about 1 million tons in Atlantic herring catch.

The Leaders

Of the 3 nations with catches above 5 million tons, only the Soviet catch increased (6.1 to 6.5 million tons); Peru's declined from 10.5 to 9.2 million; Japan's from 8.7 to 8.6 million.

U.S. catch increased from 2.4 to 2.5 million tons; U.S. won 5th place from Norway (down from 2.8 to 2.5 million tons).

1-Million-Ton Club

Among the "one-million-ton fishing countries", South Africa dropped from 2.2 to 2.13 million tons; India rose from 1.53 to 1.61 million tons; Canada fell from 1.5 to 1.41 million tons; Denmark slipped from 1.47 to 1.28 million tons; Thailand moved up from 1.09 to 1.27 million tons, Indonesia increased from 1.16 to 1.21 million tons; U.K. went up from 1.04 to 1.08 million tons; and Chile declined from 1.38 to 1.08 million tons.

The "one-million-ton fishing countries" account for about 60% of world catch: 37.7 million tons. ('Fishing News', Dec. 18/24, 1970.)

MEETINGS

OCEANEXPO 71 IN FRANCE MARCH 9-14

An international exhibition on the exploitation of the oceans will be held in Bordeaux, southern France, March 9-14. A helicopter shuttle will transport visitors from airport to exhibit center.

The program includes these subjects:

Exploitation of Ocean Resources
Industrial Development of the Continental Shelf
Exploration of the Marine Environment
Possiblities of Exploiting Ocean Depths
Industrial Development of the Seacoast
Marketing Marine Products and Developing Marine Cultivation
Analyzing and Forecasting Environmental Conditions

WORLD FISHING EXHIBITION IN DUBLIN MARCH 24-30

Dublin, Ireland, is hosting the 5th biennial World Fishing Exhibition, formerly held in London, during March 24-30. The sponsors say 15 or 16 countries will be represented.

Concurrent with the exhibit of many engines will be a display of fish and fish products at new British rail terminal at Dun Laoghaire, not far from main exhibition.

FISHERIES TRADE FAIR IN DENMARK MAY 14-23

The 7th International Fisheries Trade Fair will be held in Frederikshavn, Denmark, May 14-23, 1971. An exhibition area and mooring accommodations are available.

The fair will include "fishing vessels of all constructions," marine engines, deck machines, nets and ropes, navigation and life-saving equipment, and electronic gear.

There are daily sailings between Frederikshavn and Norway and Sweden.

Villagers in Java, Indonesia, set fish in communal fish pond.
(FAO photo: D.G.O. Davies)

ASIA

JAPAN

EXPAND SKIPJACK-TUNA SURVEYS IN SOUTHWESTERN PACIFIC

The Japanese Fisheries Agency and private firms are continuing to expand their skipjack-tuna surveys in southwestern Pacific.

Back in 1968, the Agency's 'Toshitaka Maru' (186 gross tons) traveled to Papua and New Guinea on 3-month survey to help establish Japanese-Australian ventures there. Since then, the vessel has conducted three 2-3 month surveys.

1969 & 1970 Surveys

In 1969, the Shizuoka Prefectural Fisheries Experimental Station sent 'Fuji Maru' (332 gross tons) and 'Suruga Maru' (186 gross tons) to southwestern Pacific. The latter is still investigating there.

In 1969 and 1970, the Fisheries Association of Japan conducted a government-subsidized survey of land facilities in New Guinea area to determine feasibility of establishing foreign-affiliated ventures.

Firms Interested

Based on the Agency's survey data, Japanese firms are keenly interested in developing skipjack resource. Kyokuyo Hogei joined Australian interests to form Gollin Kyokuyo, now shrimp fishing in Gulf of Carpentaria. Hogei has been conducting exploratory pole-and-line skipjack fishing off New Ireland Island since March 1970 with 1,000-gross-ton mothership 'Akitsu Maru No. 5' and three 39-gross-ton Okinawan vessels.

Full-Scale Fishing

Catches have been good--4-5 metric tons per vessel per day of fishing--and the joint company will begin full-scale commercial fishing this year. It will build a cold storage in Kavieng, New Ireland.

Other Exploratory Fishing

Two other firms, Hokoku Suisan and Nihon Suisan, are scheduled to start exploratory skipjack fishing from Manus Island off northern New Guinea.

The Japanese Overseas Fishery Company at Penang, Malaysia, will fish in that region from its base at Rabaul, New Britain Island (Bismarck Archipelago). ('Katsuo-maguro Tsushin', Nov. 2; 'Suisan Tsushin', Oct. 31, 1970.)

* * *

SEINER TO FISH TUNA IN E. TROPICAL PACIFIC & ATLANTIC

The 500-gross-ton Japanese purse seiner 'Hakuryu Maru No. 55', owned by Kawajiri Fisheries Co., left Japan Nov. 16, 1970, for eastern tropical Pacific yellowfin tuna regulatory area.

The vessel was scheduled to fish yellowfin tuna from early December 1970 until April 1971, and then proceed via Panama Canal to eastern Atlantic. There, it will fish off Ghana from July to Nov. 1971.

Failed in 1969

In 1969, vessel failed dismally in eastern Pacific yellowfin fishery. Her crew is determined to improve. ('Suisan Keizai Shimbun', Nov. 17, 1970.)

* * *

VESSEL EXPLORES FOR TUNA IN SOUTHEAST PACIFIC

The Government-chartered, Taiyo-owned 314-gross-ton longliner 'Azuma Maru No. 38', built in 1970, is exploring the tuna resource of southeast Pacific. US$178,000 was budgeted for fiscal year 1970 (Apr. 1970-Mar. 1971).

Not Much Success

She began exploring southeastern Pacific on Aug. 3, 1970, without much success. In Sept., she caught 55 tons of fish, which included 61% albacore and 35% big-eyed. Her catch in Oct. 1970 totaled only 28 tons (78% big-eyed tuna mixed with albacore, yellowfin, and swordfish). In early Nov. 1970, she explored near 25° S. latitude and 87° W. longitude (off northern Chile).

The vessel will survey south of 40° S. latitude for bluefin tuna. Return to Japan is scheduled for Mar. 1971. ('Katsuo-maguro Tsushin', Nov. 12, 1970.)

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JAPAN (Contd.):

FISH ILLEGALLY FOR KING CRAB OFF WESTERN KAMCHATKA

The Japanese fear that a king-crab poaching incident may affect Soviet-Japanese 1971 crab negotiations. In late Oct. 1970, the Japanese Maritime Safety Agency (MSA) raided 3 fishing vessels and a warehouse in Miyagi Prefecture and confiscated 25,000 cases (15 kg. each) of king crab.

MSA is pressing charges against 2 Yasukata-based companies for illegally fishing king crab in restricted areas of Okhotsk Sea off western Kamchatka between August and mid-Oct. 1970.

1969 Incident Too

In 1969, another firm was involved in an identical situation. Its vessel had illegally caught king crab in area of Okhotsk Sea where fishing had not been authorized by Japan-USSR Fisheries Agreement. At that time, the Japanese confiscated 2,000 cases and suspended one vessel for a month. ('Japan Times', Oct. 31, 1970.)

25,000 Cases Confiscated

MSA believes 1970's poaching was in part an attempt by firm to compensate for losses resulting from 1969 poaching.

The 25,000 cases confiscated in 1970 were worth US$280,000--about 14% of Japanese king crab quota off western Kamchatka under USSR-Japan King Crab Agreement.

* * *

LAUNCH STERN TRAWLER & REFRIGERATED TRANSPORTS FOR S. KOREA

A 3,000-gross-ton stern trawler ('Kaeyang') and a 1,650-ton refrigerated transport 'Chilbosan No. 3' ordered by Koryo Fishing Co. of S. Korea were launched at Hayaskikane Shipyard in Nagasaki.

Another 1,650-ton carrier, 'Chilbosan No. 5', is being built at a Korean shipyard in Pusan.

The 3,000-ton 'Takyang' was launched at Hayashikane Shipyard in Shimonoseki for Koryo.

To Fish Alaska Pollock

When completed end of 1970, the trawlers will fish Alaska pollock in North Pacific. The fish is popular in Korea, where it brings high price: 80 yen a kilogram (US$202 a short ton).

Koryo's Marketing Plan

Koryo plans to market fish from distribution point at Pusan. It is building a cold-storage plant there. Before, Koryo had concentrated on tuna fishing for export. Now it is expanding fishing operations to supply Korea.

Koryo's Fleets

Including vessels now under construction, Koryo will have 37 tuna vessels (ten 230-ton longliners, seventeen 350-ton and ten 530-ton vessels, a total of 13,550 gross tons); 2 stern trawlers (total 6,000 gross tons); and four refrigerated transports (total 5,300 gross tons). Combined total: 24,850 gross tons. ('Suisancho Nippo', Nov. 26, 1970.)

* * *

STUDY SHRIMP STOCKS IN BAY OF BENGAL

Kyokuyo Hogei is exploring shrimp grounds in northern part of Bay of Bengal. In Sept. 1970, the company began to use a 100-GRT shrimp trawler based at Khulna (East Pakistan). If the 1-year project is successful, Hogei will establish a joint venture with a local cold-storage company.

First Joint Venture

The plan was attractive to the Japanese fishing industry because there had been no Japanese-Pakistani fishing ventures. Foreign fishing had been restricted by Pakistani claims to a 12-mile territorial sea and a 112-mile conservation zone.

In the past, other Japanese firms attempted to work out a similar plan. They were unsuccessful because the fishing area in northern part of Bay of Bengal is narrow, and shrimp season is closed for 6 months. The peak season is during the winter rains. ('Shin Suisan Sokuho')

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JAPAN (Contd.):

SHRIMP TEAM VISITS THAILAND & INDIA

An 8-man Japanese "shrimp mission" visited Thailand and India for 2 weeks in Nov. 1970. It was sent by the Japanese Fishery Products Importers Assoc.

The team conferred with government and industry leader on: (1) possibilities of developing new shrimp grounds; (2) use of small shrimp and crayfish; (3) more Japanese help in improving quality; (4) establishing export inspection system; (5) measures to reduce Japanese import costs (such as ocean freight); and (6) more cooperation by Thailand and India.

Earlier Mission

Earlier in 1970, Japan had agreed to sell 20 refrigerated trucks, worth about US$278,000, to Thailand to help solve the land transportation problem. In 1969, Japanese technicians were sent to Thailand and India on a 3-month training program to help improve shrimp quality.

Japan Seeks Larger Supply

The Japanese hope that new shrimp grounds can be developed in India and other southeast Asian countries. These would supply Japan with shrimp she will need in the future. ('Nihon Suisan Shimbun', Nov. 6, 1970.)

* * *

JAPANESE ATE LESS FISHERY PRODUCTS IN 1969

Annual per-capita consumption of fish and shellfish in Japan in 1969 was 30.7 kilograms (67.5 pounds), down 5% from the 32.4 kilograms (71.3 pounds) in 1968. This was reported by the Ministry of Agriculture and Forestry.

First Drop in Decade

From 1960-1968, per capita consumption increased steadily. The 1969 decline was the first in 10 years. ('Suisan Tsushin', Nov. 10, 1970.)

* * *

MECHANICAL TUNA GEAR PERFECTED FOR COMMERCIAL USE

The mechanical skipjack-tuna poles, developed by Suzuki Ironworks, have been established as practical labor-saving devices. On Nov. 28, 1970, 10 units were installed aboard skipjack vessels and 40 more will be installed. The Fisheries Agency supports the new gear.

Commercial Use

The manufacturer has named the device "Roback K-70". It is the only one ready to be used commercially. Several similar devices are being developed in Japan. The gear's effectiveness in southern waters will be watched closely. ('Suisan Keizai Shimbun', Dec. 7, 1970.)

Prototype Modified

The major problem encountered with the first gear was that the tensile strength of the bamboo poles proved uneven. This caused fish to fall off hook. Suzuki will manufacture an improved gear. It will also study use of glass rods to obtain uniform strength.

* * *

JAPAN PROTESTS U.S. BAN ON IMPORTING WHALE PRODUCTS

The U.S. placement of eight species of whales on the endangered species list--thus barring imports of their products--has stunned the Japanese whaling industry.

In 1969, Japan exported to the U.S. $2.4 million worth of whale meat and oil. This included 8,700 tons of sperm-whale oil, 87% of Japan's exports of that product. The U.S. action will put sperm-whale oil in short supply in the U.S. and create a surplus in Japan despite growing domestic demand for it.

Japan Protests

In late Nov. 1970, Japan reportedly protested to U.S. State Department. She claimed U.S. action was unjust and urged removal from endangered list of species whose inclusion would hurt Japanese industry. ('Suisan Tsushin', Dec. 4; 'Suisan Keizai Shimbun', Nov. 27, 1970.)

* * *

JAPAN (Contd.):

JAPANESE-PHILIPPINE SHRIMP VENTURE

To increase shrimp purchases from the Philippines, the Nichiro Fishing Co. recently established South Sea Fisheries Research Inc. in partnership with Ramos Co., a local Philippine firm. Ramos contributed 70% and Nichiro 30% of the $33,000. A small cold-storage plant was leased at Bacolod, Negros Island, and began operations Dec. 1, 1970.

Japanese Purchases Rise

Though shrimp is abundant off the Philippines, much is consumed locally and little is left for export to Japan. In Feb. 1970, to stimulate exports and earn hard currency, the Philippines lowered the exchange rate from 3.9 pesos to 6 pesos per US$1. This benefited Japanese firms, which began to buy more shrimp.

In 1969, Japan had imported from the Philippines around 100 metric tons of frozen shrimp; by the end of October 1970, imports had increased to 230 tons. Nichiro purchased only about 30 tons, but the joint venture is paving the way toward larger purchases. ('Suisan Keizai Shimbun', Dec. 4, 1970.)

NMFS Comment

Comment by NMFS Division of Foreign Fisheries:

The Japanese began to show an interest in Philippine shrimp in late 1968 when it became obvious that domestic demand would exceed supplies in the coming years. In Oct. 1968, the Government subsidized 75% of 1-month trip of 8-man "shrimp survey team," organized by Japanese Association of Importers of Marine Products, through Southeast Asia; the Philippines was included. Findings were published in Dec. 1968: Japanese traders were warned that quality of shrimp imports from Philippines might be below standard. Shrimp dealers are concentrated in Manila--but shrimp are landed in other ports and transferred to Manila with considerable delay. Supplies were limited and high priced.

In 1969, the Philippines caught about 53,100 metric tons of shrimp (29,600 tons were fresh-water species). This was only 10% above 1968, when 49,000 tons of marine and fresh-water shrimp were landed.

* * *

PLANS JOINT FISHING VENTURE IN GAMBIA

The fishing firm, Nichiro, and trading firm, Marubeni Iida, have agreed with Gambian Government and local firms to form a joint fishing and processing venture in Gambia in Jan. 1971. Capitalization is US$240,000: Marubeni Iida, 37%; Nichiro 35%; Gambia 10%; and local private interests 18%.

The Plans

The company will fish for tuna and shrimp, and process and freeze fish. The Japanese partners were requested to construct a 500-ton cold storage plant by May 1971 and to provide trawlers.

Crayfish will be harvested with canoes and nets, processed, and exported mainly to France--but also to other European countries. ('Suisan Tsushin', Dec. 8, 1970.)

* * *

SURVEY COSTA RICAN & NICARAGUAN FISHERIES

Two experts of the Japanese Fisheries Agency surveyed Costa Rican and Nicaraguan fisheries throughout Nov. 1970. Costa Rica and Nicaragua had requested the surveys to promote their fisheries.

Interested In Skipjack

The team studied the fisheries, including only skipjack among the tunas. It will determine the feasibility of Japanese fishery cooperation. The agency is especially interested in skipjack resource; Costa Rica and Nicaragua want to develop it because U.S. tuna packers import much raw skipjack. ('Katsuomaguro Tsushin', Nov. 13, 1970.)

* * *

SOUTH KOREA

PLANS TO QUADRUPLE OYSTER PRODUCTION

The Republic of Korea (ROK) Fisheries Office will spend about 2.6 billion won (US$9.4 million) in a 6-year period to quadruple oyster production. Oyster culture off southern coast will be improved with funds from ROK, local governments, and private interests.

Annual Allocations

Annual allocations: 1970: 300 million won ($1.1 million); 1971: 488 million won ($1.8 million); 1972: 488 million won ($1.8 million); 1973: 300 million won ($1.1 million), 1974: 677 million won ($2.5 million); 1975: 300 million won ($1.1 million). Total: 2,553 million won ($9.4 million).

35% Rise Yearly Needed

The Director General of Korean Fisheries Agency emphasized need to increase oyster culture at rate of 35% a year to meet growing demand at home and abroad.

To increase production, 10,000 cho (1 cho equals 2.45 acres) will be developed off southern coast during 6-year period.

1970 Construction

A freezing plant of 600-ton capacity and a cold storage of 150-ton capacity were scheduled to be built in 1970 for 50 million won ($187,000).

1976 Oyster Output

ROK's oyster production in 1976 would total 24,000 metric tons, of which 14,000 metric tons would be exported: 10,000 tons fresh, 2,000 tons frozen, and 2,000 tons canned. ('Suisan Tsushin')

Sanyung Frozen Sea Food Co. in Pusan, S. Korea. FAO reports that fishing industry provides about 85% of annual protein needs of people--and is a major source of foreign exchange. (FAO photo)

EUROPE

NORWAY

FIRST FACTORY SHIP ON FISHING EXPEDITION OFF AFRICA

The Norwegian factory ship 'Norglobal', with 12 purse seiners, is fishing east of Canary Islands. The vessels plan to return to Norway in summer 1971.

The Norglobal has a 24-hour maximum production capacity of 3,000 tons of raw material. Raw material storage capacity equals 40 hours of continuous operation. The pellet storage facilities can hold about 10,000 metric tons; fish-oil storage capacity is about 2,400 tons.

Independent of Ports

The vessel can load and unload supplies in the open sea and so is independent of ports. The crew numbers 60.

Operating conditions and availability of fish will be decisive factor in determining how long to fish.

The vessel is seeking horse-mackerel.

Its Owners.

The Norglobal, 26,500 deadweight tons, is owned by Sigurd Herlofsen and Co., Oslo, and 7 fishing-boat owners from North Norway. ('Fiskaren', Nov. 19, 1970.)

DENMARK

FAROE ISLAND FISHERY EXPORTS INCREASED 53% DURING 1970

Final figures on 1970 Faroese fishery exports were expected to set a record. During the first 9 months, the value of exports was $22.8 million--more than 53% above $14.8 million during 1969 period. Over 95% of these exports were products bought mostly by Italy (saltfish) and the U.S. (frozen fish).

U.S. Agents

To increase exports to North American market, the Faroese Fish Export Central in Thorshavn, "Fóroya Fiskasøla," is cooperating with large Icelandic sales firm in U.S., the Coldwater Seafood Corporation, which will represent Faroese producers.

Coldwater's shareholders are all Icelandic producers who belong to Icelandic Freezing Plants Corp. in Reykjavik; the latter has 60-70 fish filleting factories as members in Iceland. Corporation exports of frozen fishery products are being handled by Coldwater, which has established a strong sales organization during the last 70 years. Exports to the U.S. during 1970 were expected to reach US$50 million.

To Meet U.S. Demands

Up to now, Faroese producers have only exported filleted cod and haddock in blocks to U.S., but they will begin to ship individual consumer packs in various sizes to meet demand of U.S. housewife at supermarkets. ('Politiken', Dec. 15, 1970.)

UNITED KINGDOM

NEW FISH-LABELING REGULATIONS SCHEDULED FOR 1973

Fish-labeling regulations originally slated for the U.K. in 1970 will not be put into effect until 1973.

Requirements for salmon and tuna are of specific interest to U.S. exporters. The fish must be "appropriately designated" according to species. Only Thunnus and Neothunnus will qualify for labeling as tuna. Other species will have to be named specifically: albacore tuna, skipjack tuna, and bonito tuna.

Labeling Salmon

Similarly, only Salmo salar will qualify for straight salmon labeling. Other species will have to be designated as cherry salmon, pink salmon, chinook salmon, sockeye salmon, or as otherwise specified.

The U.S. Embassy in London is looking into the labeling provisions under the Fish and Meat Spreadable Products Regulations 1968 to see how these will affect U.S. exports of flaked and chopped salmon and tuna. (U.S. Embassy, London, Dec. 21, 1970.)

WEST GERMANY

WEST GERMANS DEBATE IMPORT OF HERRING FROM EAST EUROPE

Herring imports from eastern Europe are dividing the W. German fishing industry. Processors want cheaper imports, but fishermen's associations complain about unfair competition. The "war" was being fought in press releases, reported the fishing journal 'Allgemeine Fischwirtschaftszeitung' on Oct. 9, 1970.

The Processors' Association claims it is impossible to operate with herring prices up as much as 15-20%. It criticizes "protective measures" that make it impossible to import "good and cheap herring" from East Europe. Only by "mixed" prices--prices reflecting cheap E. European herring and more expensive domestic herring--will herring consumption in W. Germany remain high.

Alarm About More Imports

The Fishermen's Association provides about half the raw herring needed by German processors each year. It complains about "dumping prices" of Eastern imports. These prevent normal planning. Increases in imports at much low prices might even endanger industry's profitability.

The journal noted that herring imports from East Europe were substandard quality by West German standards. It warned against excessive reliance on "East Bloc" imports that were sensitive to political developments. This referred to Soviet pressure on Iceland in early 1950s, when former refused to buy herring because Iceland had joined NATO; this almost collapsed the entire Icelandic industry.

The W. German industry obtains about 30% of its annual herring catch from Georges Bank (in 1969, 72,000 metric tons of 253,000 tons caught in ICNAF area). If E. European imports depress herring price, it may become prohibitive for W. Germany to fish so far away. Its attention might turn then to North Sea grounds, especially if resources there improve.

USSR

FISHERMEN CLAIM SOVIET-BUILT STERN FACTORY TRAWLERS ARE DEFECTIVE

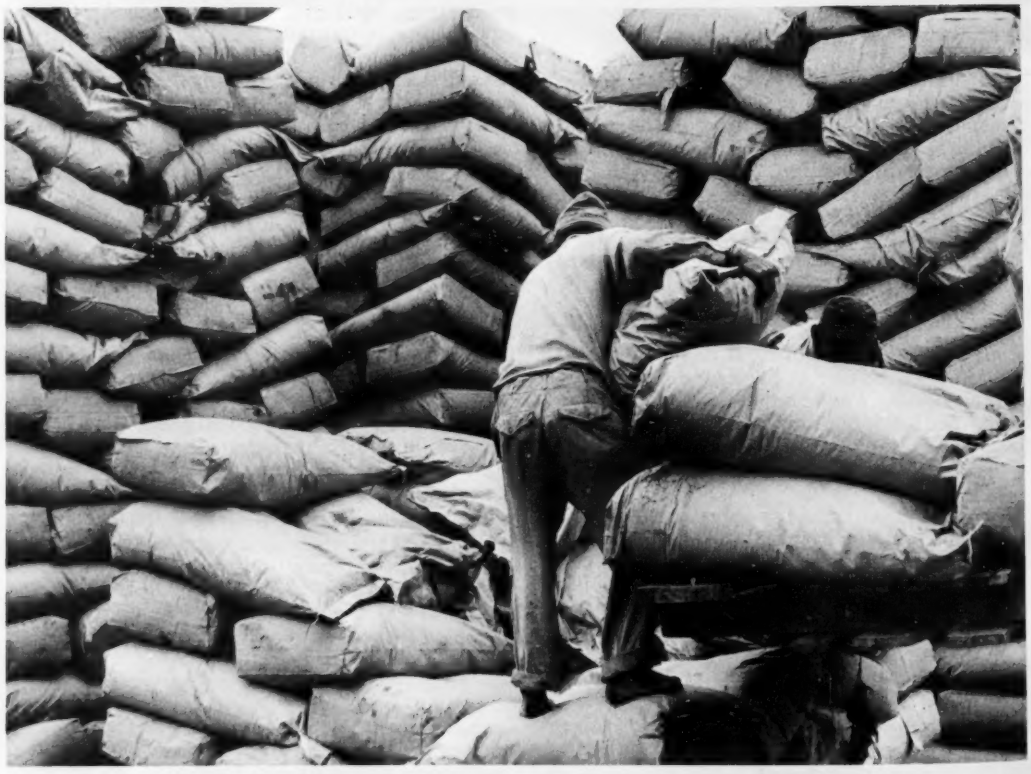
A new series of trawlers specially designed and built in the Soviet Union for tropical and Antarctic seas is totally inadequate to its task, according to a recent article in 'Pravda'. The article was sparked by a letter from three crew members of the new trawler 'Pioner Latvii'. They complained that on a short trip it was impossible to attain the planned catch quota. They criticized the official who ordered mass production of the series. The design did not correspond to modern requirements and the equipment was defective, they charged.

The Charges

The design was presented by the Leningrad firm, MORPROMSUD, which "tried to stuff heavy, untested, and poorly assembled equipment into the hull of an old design." The vessel was put into mass production despite considerable expense, bother, and disputes. The cost overruns on the Pioner Latvii and her successors, 'Volzhanin' and 'Sakelkhard' ran to 50% of original estimates.

Defects

The automatic equipment does not correspond to designers' concepts, fishermen's requirements, nor to Soviet technical standards. The designers under P. Tkachev created an automated, self-refrigerating unit. No specialized enterprise was brought in when these refrigeration units were designed. The Ministry of Shipbuilding entrusted job to Black Sea shipbuilders. They installed units into 3 vessels without tests. "The refrigerators do not freeze the fish. . .they heat them," complained Pravda.



Bags of fish meal stacked outside Peruvian factory. (FAO)

LATIN AMERICA

PERU

FISHMEAL OUTPUT ROSE

Peru produced a record 2.3 million short tons of fishmeal in year ending Sept. 30, 1970. This was increase of 437,000 tons, 23%, over same period 1968-69.

The increase reflected large improvement in average meal extraction rate and expansion of total catch by 6% to record 11.7 million tons.

1969-70 Exports Down

Exports in 1969-70, just over 2 million tons, were down 7%. The volume was equivalent to 125 million bushels of soybean protein, 9 million fewer than in 1968-69. Most of reduction was reflected in smaller movement to U.S.

Fishmeal Production & Exports

Year beginning Oct. 1	Fish Catch	Extraction Rate	Fishmeal Prod.	Fishmeal Exports	Residual
	Million Short Tons	Percent	(Million Short Tons)		
1964-65	8.3	18.6	1.55	1.57	-.02
1965-66	8.8	18.5	1.63	1.30	+.33
1966-67	9.0	17.7	1.59	1.55	+.04
1967-68	10.8	21.0	2.27	2.11	+.16
1968-69	11.0	17.1	1.88	2.28	-.30
1969-70	11.7	19.8	2.32	2.03	+.29
1970-71 1/	12.0	19.5	2.34	-	-

1/Projected.

These data come from 'Foreign Agriculture', published by U.S. Department of Agriculture, Dec. 21, 1970.

Magazine's Assessment of 1970-71 Outcome

Although it is early to attempt assessment of final 1970-71 outcome, the magazine cautions, it makes these observations:

(1) Total tonnage of landed anchovy has increased every year since 1962-63 by average volume of over 700,000 tons. Annual increases ranged from 200,000 to 1,800,000 tons.

(2) The average meal extraction has been erratic within a range of 17 to 21%. To a large extent, the extraction rate is subject to seasonal variations in uncontrollable fishing conditions.

(3) Upgrading of fish-processing equipment to include evaporators for recovery of fish solubles could, potentially, increase overall extraction rate by at least 10%.

(4) In 1969, the Peruvian industry added 75 new catcher boats. An even larger number was being added in 1970.

(5) Assuming no substantial reduction in 1971 year-class of anchovies, it seems likely that 1970-71 catch will increase somewhat. The widely varying extraction rate may be estimated at slightly above average rates of last 3 years. So production might approximate last season's record volume.

(6) Available exports, including stocks, will rise--perhaps near 2.7 million tons, or 270,000 above year earlier. Estimated increase in supplies would be equivalent to about 18 million bushels of soybean protein.

INDEX

Page

UNITED STATES:

1 . . U.S. & USSR Hold Scientific Exchange On Northeast Pacific Fishery Problems
3 . . U.S. and Japan Conclude Fishery Agreements
7 . . Fishery Products Situation, by Donald R. Whitaker
8 . . 1970 Albacore Landings Top 1969's
10 . . 'Kelez' Conducts Salmon Research Fishing Cruise, by Robert R. French
10 . . 1970 Oregon Coho Catch Was Weight Record
11 . . Anchovy Fishery Passes Midpoint Toward Quota
11 . . Mercury Residues Sharply Affect U.S. Imports From Japan
11 . . DDT Level Increases in Lanternfish

Alaska:

12 . . 1971 Drop in Alaskan Salmon Predicted
12 . . Industry Suggests Shrimp Quota for Kodiak
12 . . Live Alaska Crabs Flow Steadily to Hawaii
12 . . Salmon Roe Market Is Expanding
13 . . Pacific Whale Watchers Are At Their Posts
14 . . Water Pollution Killed 41 Million Fish in 1969
16 . . Water-Quality Drop in Upper Great Lakes Threatens Native Fish
17 . . Lummi Indians' Aquaculture Project Nears Commercial Production
18 . . Commercial Aquaculture in New England Is Years Off
20 . . Gloucester Fishermen Aided By Women's Group

Oceanography:

21 . . 'Glomar Challenger' Replaces Drill Bit 3 Miles Down
22 . . 15 U.S. Ships Study Deep Ocean & Coastal Waters
22 . . Plan Continental-Shelf Lab Off Texas
23 . . Surveying the World's Coral Reefs
23 . . Recovering Undersea Treasures
24 . . 8 Universities Buy Their Ocean Lab Site On L.I.'s Eastern Tip
25 . . VIMS Develops Coastal Environmental & Engineering Data Center
26 . . Navy Succeeds in Getting Ocean Data Via Buoy-Satellite Hookup
27 . . Navy Develops Deep-Diving System
28 . . Dead Mangrove Leaves Support Aquatic Life
29 . . NOAA Awards Sea Grant to Study Sponges' Antibiotic Substances

ARTICLES:

30 . . In the Northeastern Gulf of Mexico — Harvesting Coastal Pelagic Fishes With Artificial Light & Purse Seine, by Donald A. Wickham
39 . . Evidence indicates that — A Premix of FPC & Wheat Flour Can Be Made & Transported, by Virginia D. Sidwell, Bruce R. Stillings, & George M. Knobl Jr.

Page

INTERNATIONAL:

42 . . Soviet Scientist Assesses Future of World Fisheries
43 . . Stop Marine Pollution At Sources, FAO Conference Recommends
44 . . Halt Destruction of Coral Reefs, Scientists Urge
45 . . World Fisheries Catch Dropped in 1969

Meetings:

45 . . Oceanexpo 71 in France, March 9-14
45 . . World Fishing Exhibition in Dublin, March 24-30
45 . . Fisheries Trade Fair in Denmark, May 14-23

Asia:

Japan:

47 . . Expand Skipjack-Tuna Surveys in Southwestern Pacific
47 . . Seiner to Fish Tuna in E. Tropical Pacific & Atlantic
47 . . Vessel Explores for Tuna in Southeast Pacific
48 . . Fish Illegally for King Crab Off Western Kamchatka
48 . . Launch Stern Trawler & Refrigerated Transports for S. Korea
48 . . Study Shrimp Stocks in Bay of Bengal
49 . . Shrimp Team Visits Thailand & India
49 . . Japanese Ate Less Fishery Products in 1969
49 . . Mechanical Tuna Gear Perfected For Commercial Use
49 . . Japan Protests U.S. Ban On Importing Whale Products
50 . . Japanese-Philippine Shrimp Venture
50 . . Plans Joint Fishing Venture in Gambia
50 . . Survey Costa Rican & Nicaraguan Fisheries

South Korea:

51 . . Plans to Quadruple Oyster Production

Europe:

Norway:

52 . . First Factory Ship On Fishing Expedition Off Africa

Denmark:

52 . . Faroe Island Fishery Exports Increased 53% During 1970

United Kingdom:

52 . . New Fish-Labeling Regulations Scheduled For 1973

West Germany:

53 . . West Germans Debate Import Of Herring From East Europe

USSR:

53 . . Fishermen Claim Soviet-Built Stern Factory Trawlers Are Defective

Latin America:

Peru:

55 . . Fishmeal Output Rose
56 . . INDEX

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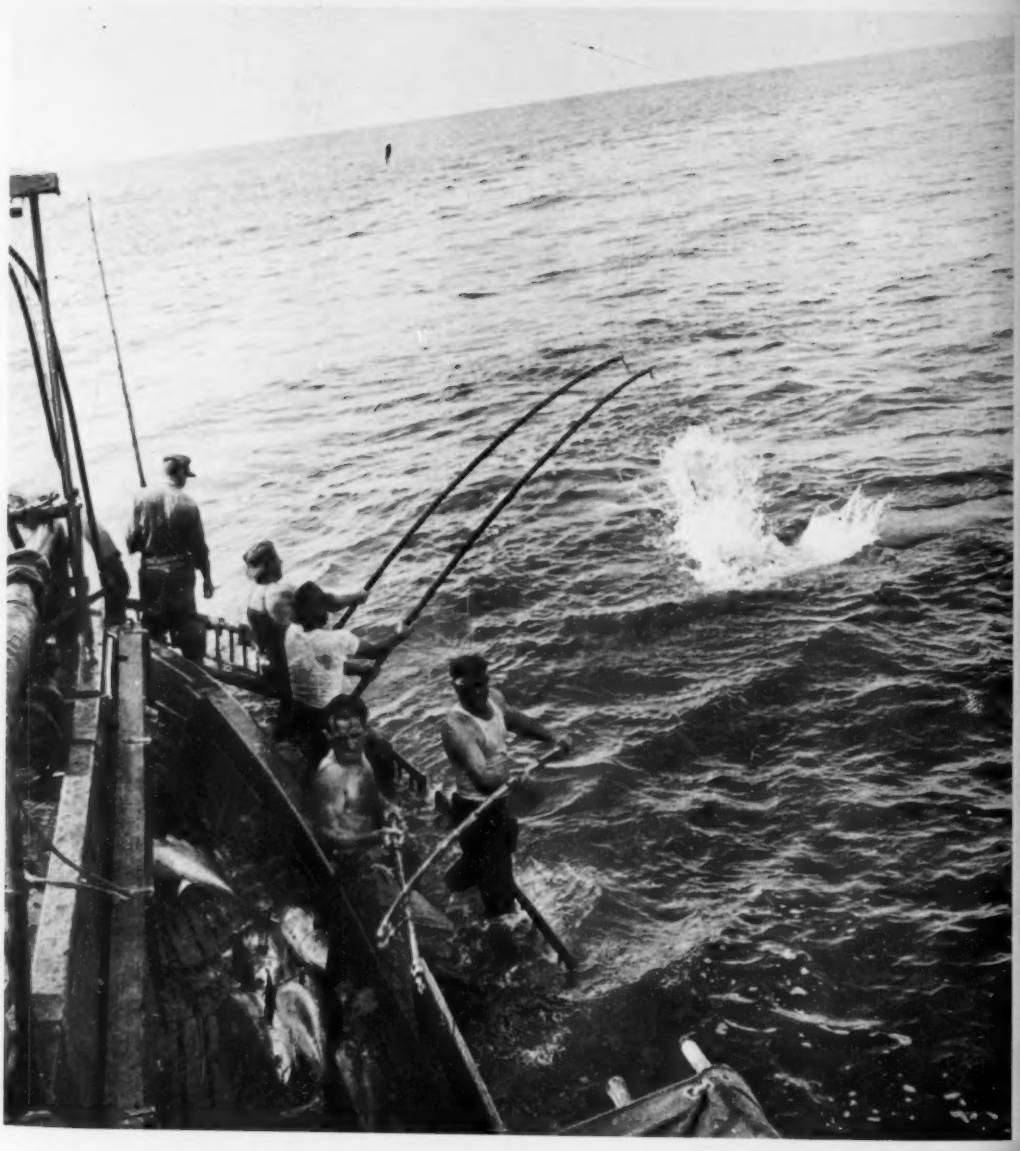
BACK COVER: Thousands of miles from Alaskan cover girl, these men are catching tuna.